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NHS England



Promoting appropriate antimicrobial prescribing in secondary care

Philip Howard

Consultant Pharmacist

Twitter: AntibioticLeeds

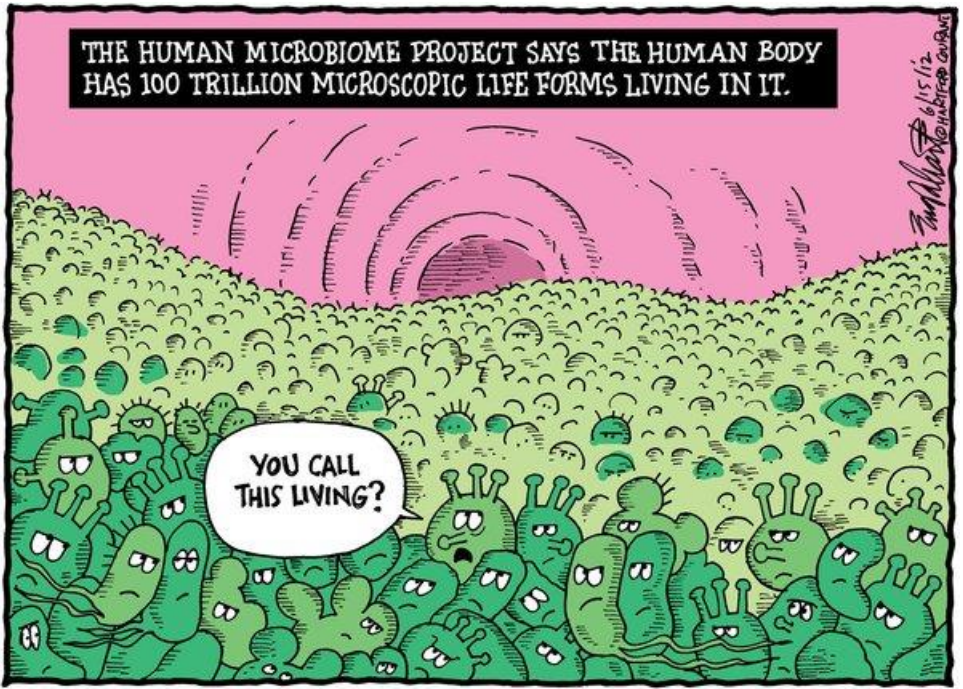
p.howard@leeds.ac.uk

UNIVERSITY OF LEEDS

The Leeds Teaching Hospitals NHS Trust

Human Microbiome "Gut Flora"

- 10 times more cells than human cells. ~200g of symbiotic bacteria
- Protective effect against auto-immune diseases like diabetes, rheumatoid arthritis, muscular dystrophy, multiple sclerosis, fibromyalgia, and perhaps some cancers.



- Protect against invading pathogenic bacteria
- Microbiota are very similar in healthy people
- Chemotherapy and antibiotics can destabilise it



UK 5year Antimicrobial Resistance Strategy 2013-8: 7 key areas for action

DH – High Level Steering Group

PHE
Human health

- Optimising prescribing practice
- Improving infection prevention and control
- Improving professional education, training and public engagement
- Better access to and use of surveillance data

Defra
Animal health

- Optimising prescribing practice
- Improving infection prevention and control
- Improving professional education, training and public engagement
- Better access to and use of surveillance data

DH

- Improving the evidence base through research
- Developing new drugs, vaccines and other diagnostics and treatments
- Strengthening UK and international collaboration

What is antimicrobial stewardship?

- Term few people understand – time for new term?
- No agreed global definition of AMS
  - WHO AMR STAG recognises the need for a standard definition of AMS, and its components
- Draft NICE AMS guideline definition:
  - ‘an organisational or healthcare-system-wide approach to promoting and monitoring judicious use of antimicrobials to preserve their future effectiveness’.

To the non expert, what really is AMS?

"Antimicrobial stewardship:

- is an **inter-professional effort**, across the continuum of care
- involves timely and optimal selection, dose and duration of an antimicrobial
- for the best clinical outcome for the treatment or prevention of infection
- with minimal toxicity to the patient
- and minimal impact on resistance and other ecological adverse events such as *C. difficile*"

[Nathwani et al., 2012]

4 goals of AMS

1. Improve patient outcomes
2. Improve patient safety (eg *C.difficile*)
3. Reduce resistance
4. Reduce healthcare costs

Problems with hospital AMS activity?

- IPC and AMS are often run as two different services = inefficient
  - Nurses connect with IPC & less with AMS
  - Doctors connect with AMS & less with IPC
- Where no e-Rx, good usage data is limited
- Limited AMR data to specialty level, and often at hospital level
- Audit not linked to outcomes
- We don't monitor for unintended consequences:
  - ototoxicity with gentamicin, clavulanic acid allergy
  - AKI with high dose flucloxacillin
- Nobody (really) holds acute Trusts to account (unless HCAI figures aren't met)

Current and future AMS guidance

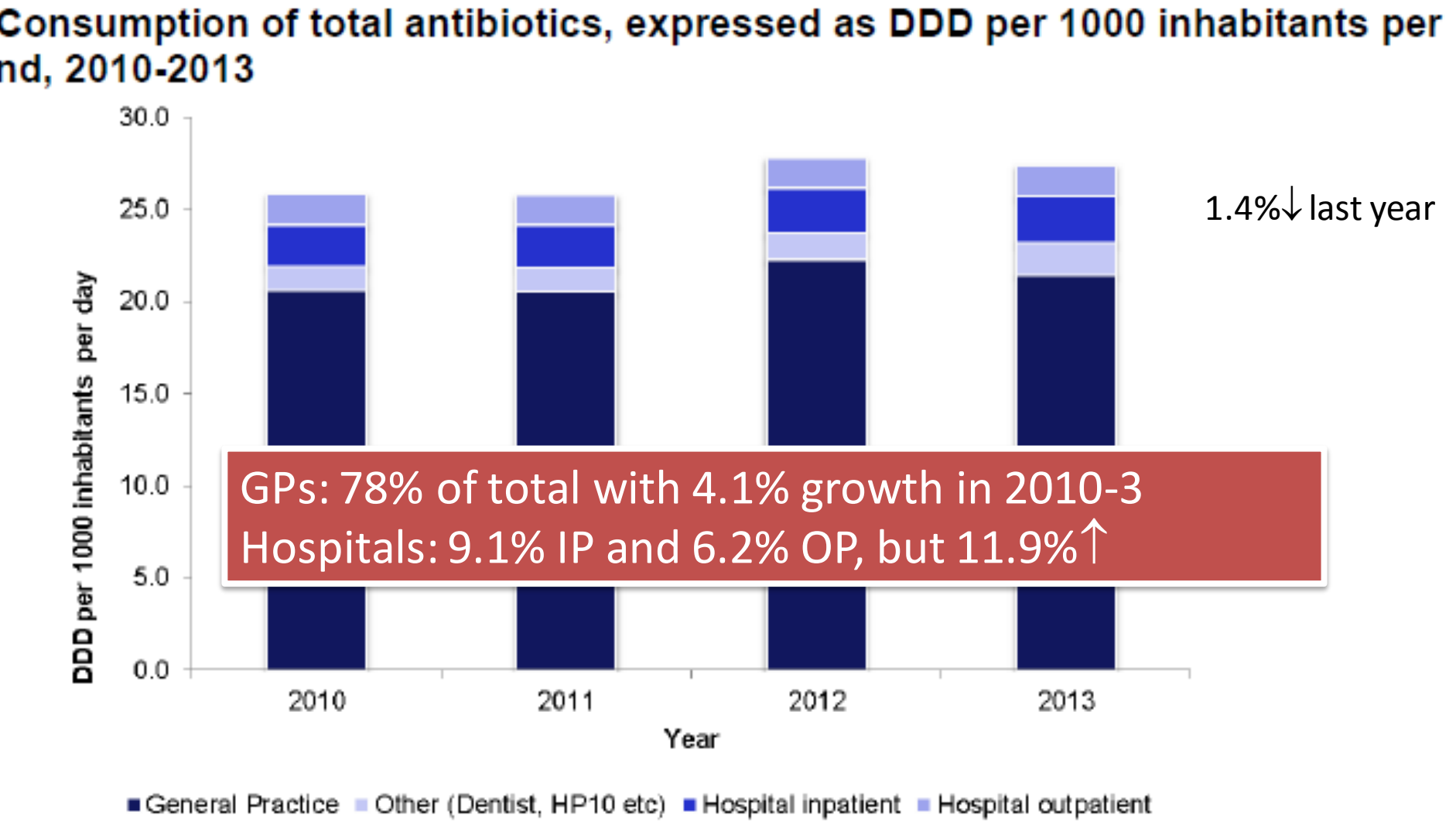
Current hospital AMS guidance or reports

- Start Smart then Focus 2011 (update 2015)
- HEE Antimicrobial prescribing & stewardship competencies
- ESPAUR data (usage & AMR) to Area Team level
- Sepsis toolkits (& mandatory national CQUIN in '15/16)

Future guidance or reports

- H+SC Act 2008 IPC Code of Practice update – criterion 3 Ensure appropriate AB use to improve outcomes & decrease AMR (Apr)
- NICE AMS clinical guideline (Jul-15)
- HEE AMR+S E&T Frameworks (2015/6)
- Quality Premium: 2015/6 and beyond (back to 2010 levels)
- ESPAUR data down to hospital & specialty level (???)

ESPAUR 2014: 6%↑ in consumption between 2010-13



Antibiotic use & AMR: 2010 – 2013

- Pressure to reduce cefalosporins and quinolones to ↓ *C.difficile* (& co-amoxiclav in Scotland)
- 48%↓ overall in cefalosporins (GPs 55%↓ and Hospitals 10%↓)
- 5%↓ in quinolones (GPs 6%↓, Hospital IP ↑10%, Hospital OP ↑5%)
- Amoxicillin-clavulanate ↑13%, piperacillin-tazo ↑ by 46%, carbapenems↑31%
- *E.coli & Kleb pneum* BSI ↑ but not resistance
- *Pseudomonas & Strep pneum* BSI ↓ rates

5 Essential & 4 additional AMS Strategies

Hospital

- AMS Structure & Governance

1. Formulary with restriction and prior approval
2. Selective reporting by micro in line with AM guidelines

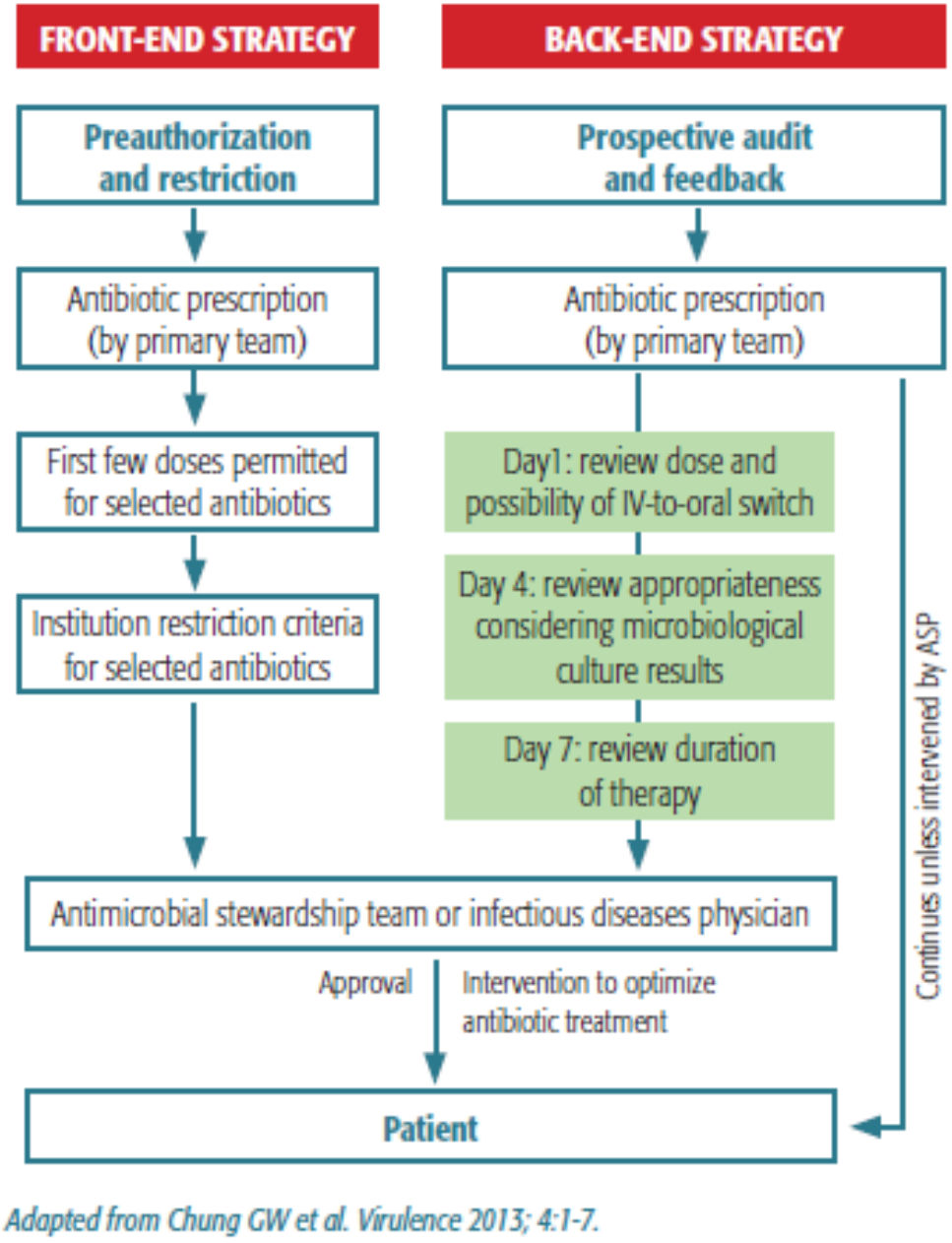
- IT – e-Rx, decision support, on-line approvals
- Antibiograms

Unit or ward

1. Clinical Guidelines
2. Monitoring performance of reporting (usage data, auditing use, quality use indicators)
3. Review antimicrobial prescribing with intervention & direct feedback

- POC interventions: streamlining, IVOS, dose optimisation, TDM
- Education

AMS in Australian Hospitals 2011



Adapted from Chung GW et al. Virulence 2013; 4:1-7.

Front end

- Antimicrobial policy "rule book"
- Formulary & restriction
- Guidelines or pathways for treatment & prophylaxis
- Less popular with prescribers

Back end

- Antimicrobial review: commonly indication, IVOS, TDM, allergy, C&S results, ADRs. Less commonly: bacteraemia, specific AB, dose optimisation.
- Audit & direct feedback to prescribers
- Diagnostic tools eg procalcitonin
- More labour intensive

DoH 2011 (+2015): Start Smart then Focus AMS

Structure & Governance

Accountability at hospital executive / board level

- DTC, IPC & AMS teams

Dedicated resource

- core team of ID or micro doctor and clinical pharmacist

AMS Committee

- Core team + physician, surgeon, nursing, IT, junior staff (+ primary care)

ASAT – AMS in AT = measure it!

Essential strategies

- clinical guidelines
- antibiotic restriction
- review of antibiotic prescribing with direct feedback
- audit & usage monitoring
- selective reporting of antimicrobials
- education
- point of care testing
- de-escalation
- dose optimisation
- Information technology
- antimicrobial susceptibility data

New world IPC & Treatment (IPCT) Teams

- Merge IPC & AMS teams to maximise efficacy & increase manpower.
- Senior leadership – ideally medical director
- Joint meetings incorporating both agendas at all levels
  - Health & Wellbeing Boards, Council Lead Control of Infection meetings, AT IPC Committees, IPC**T** meetings
- Local ownership of IPC + AMS by specialities
  - Develop champions or antibiotic guardians

ANTIBIOTIC GUARDIAN

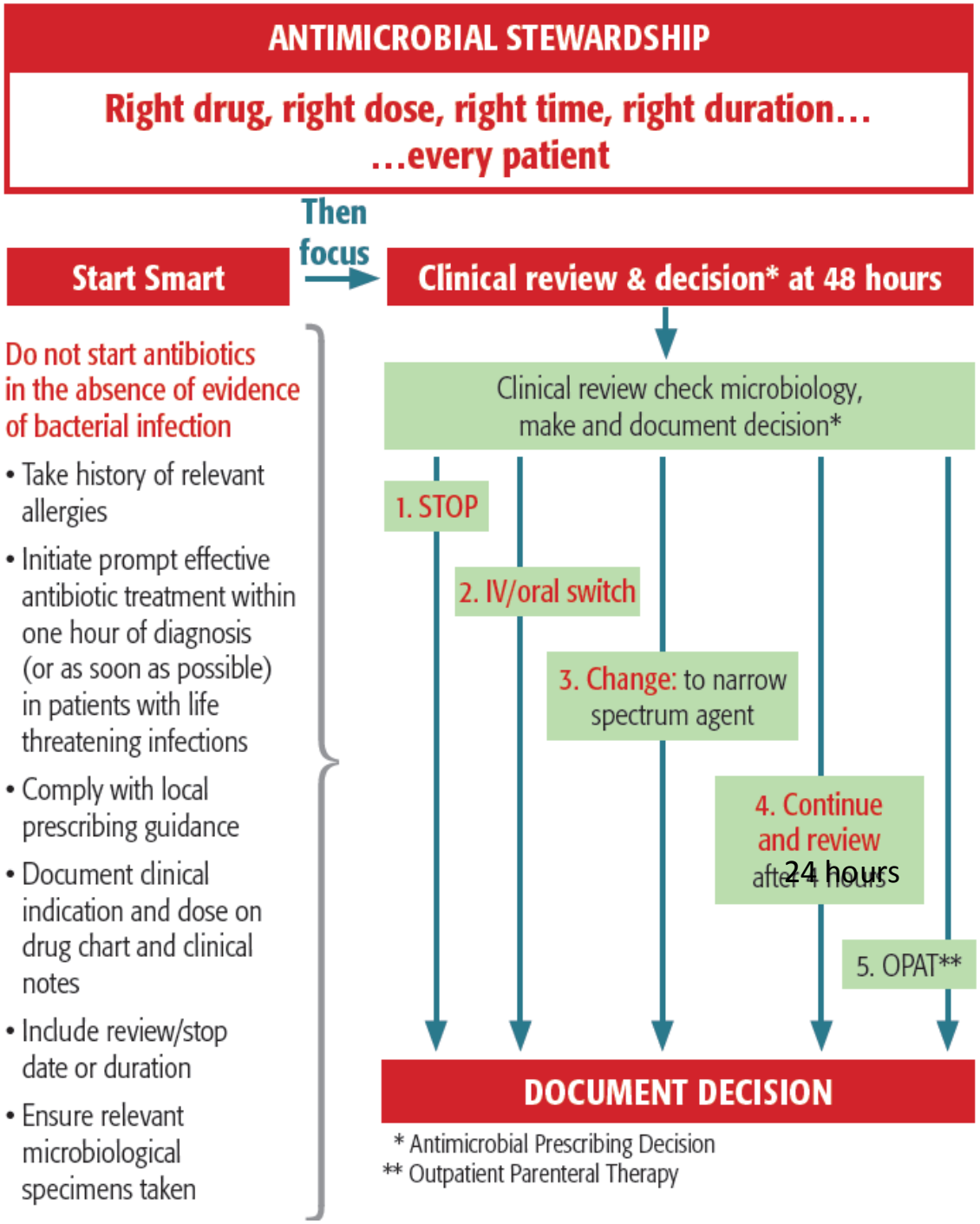
www.antibioticguardian.com

AMS complimentary roles

NHS England

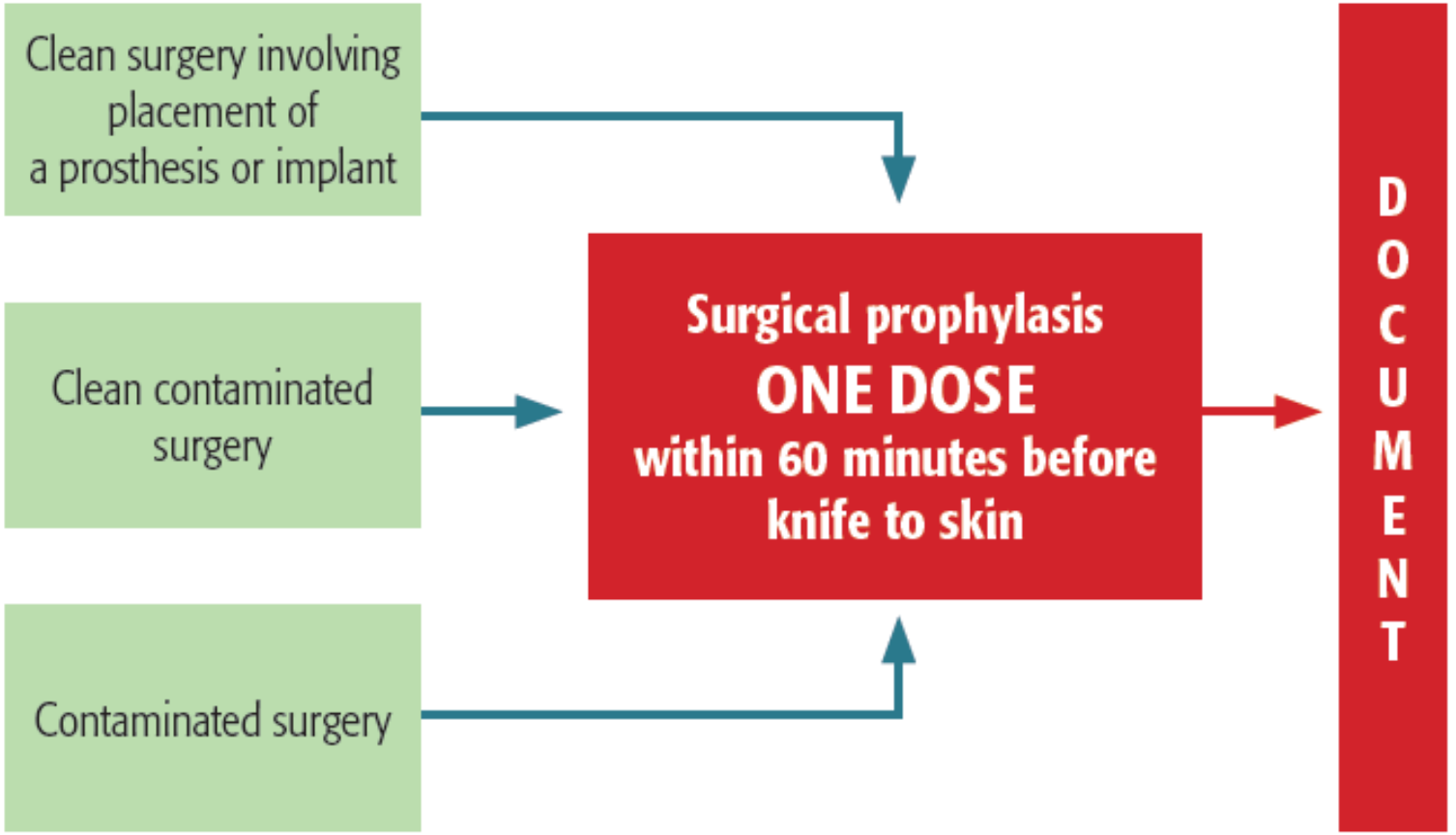
AMS strategy	Medical Lead	Pharmacy lead
AMS Committee	AMS Chair – better medical engagement	AMS Prof Sec - Good at organising committees
Guidelines and policies	Diagnosis, investigations, non antimicrobial treatment, local drug choice	Drug dosing, processes eg. IVOS AMS policy
Audit & feedback	Feedback to difficult audiences	Tools, doing & feedback
Education	AMS ward rounds - diagnosis & investigations	Antibiotic related, e-learning
Surveillance	Antimicrobial resistance	Antimicrobial usage
Individual patient advice	Treatment failures Telephone support	Dose optimisation (TDM) OPAT management
Miscellaneous		Formulary & restriction IT systems: web, Apps, etc Patient safety & communication • incidents, systems, prescriptions

Dept of Health Antimicrobial Stewardship Guidelines for England



- 1st national AMS guidelines that recommended OPAT in them
- New sepsis toolkits will make the focus even more important

SINGLE DOSE SURGICAL PROPHYLAXIS*



* A repeat dose dose of prophylaxis may be required for prolonged procedures or where there is significant blood loss. A treatment course of antibiotics may also need to be given (in addition to appropriate prophylaxis) in cases of dirty surgery or infected wounds. The appropriate use and choice of antibiotics should be discussed with infection specialists for each case.

Antimicrobial Stewardship for Acute Trusts tool (ASAT) Cooke 2010 JAC

8 sub-sections addressing a specific components:	Max points
1. Antimicrobial management within the trust	9 pts
2. Operational delivery of an antimicrobial strategy	43 pts
3. Risk assessment for antimicrobial chemotherapy	5pts
4. Clinical Governance assurance	13pts
5. Education and Training	46pts
6. Antimicrobial Pharmacist	11pts
7. Clinical Microbiologist	7pts
8. Patients, Carers and the Public	16pts

Total 150 pts. No target score but aim to benchmark annually and ongoing improvement. **High score for 2, then generally lower CDI rates.** **www.researchdirectorate.org.uk/uhsm/asat/asat.asp**

Design systems to improve AMS

SHORT COURSE ANTIMICROBIALMEDICINES

All antimicrobials should be reviewed daily in accordance with the Trust Antimicrobial Medicines Code. This includes a clinical review and a review of microbiology tests. It should decide if it is appropriate to stop, switch IV to oral, change or continue the antimicrobial. The drug administrator should request a medical review if antibiotics have not been reviewed after 48hours. Prescribe long term antimicrobial therapy on regular section; prescribe procedure prophylaxis as single doses in once only section.

Check allergy status on front page and record here.	
Antibiotic	**Type of reaction**

Drugs containing penicillins:
Amoxicillin, Flucloxacillin,
Co-amoxiclav (Augmentin),
Piperacillin /Tazobactam (Tazocin),
Cofluampicil (Magnapen),

Co-trimoxazole contains Trimethoprim and Sulfamethoxazole

For patients over 65 years - avoid cephalosporins, ciprofloxacin, and clindamycin except where recommended.

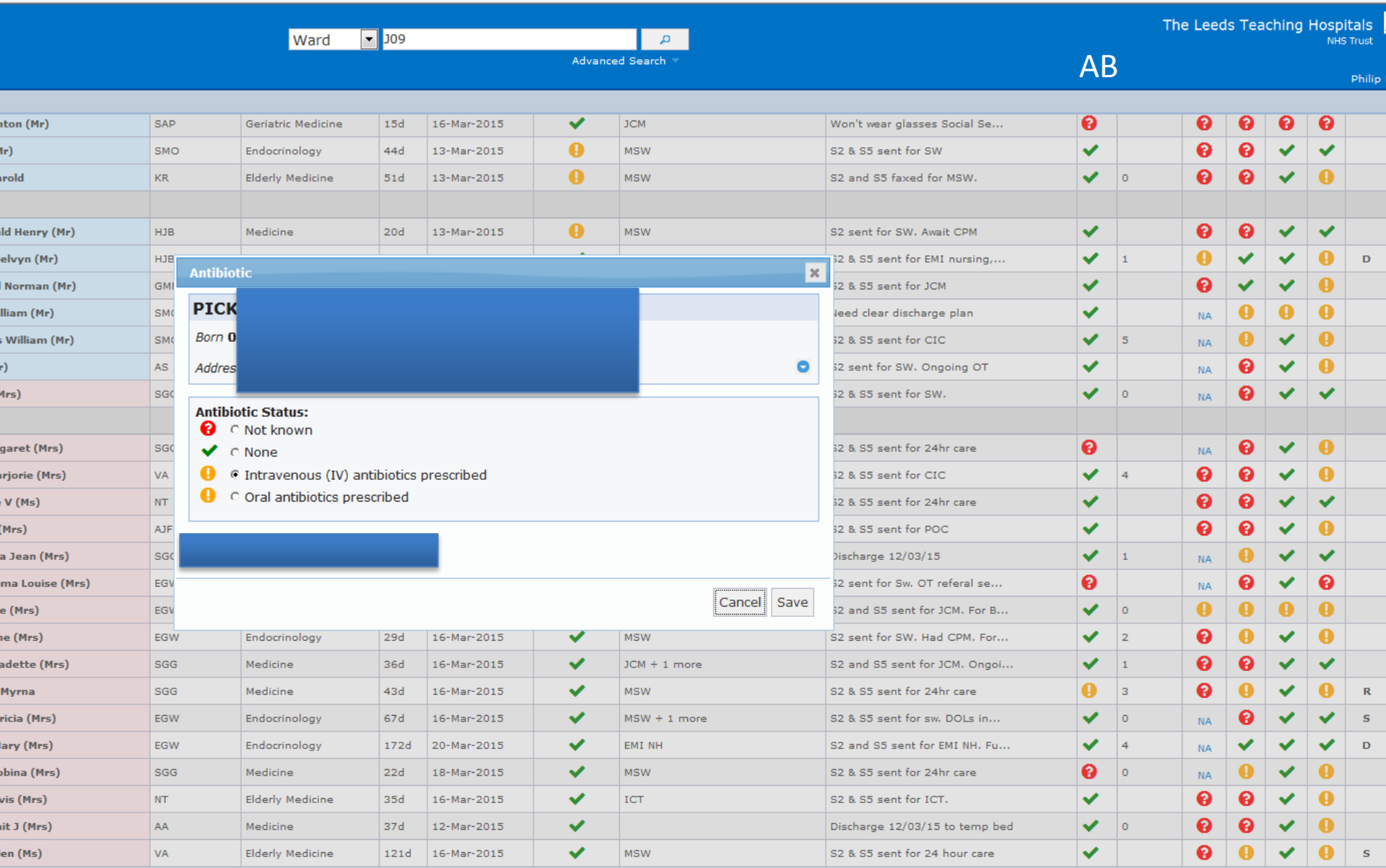
M E D I C I N E							**REVIEW CODES DAILY**
DOSE	microgram	mg	gram	other	Route	Additional information *(e.g. antimicrobial codes)*	Stop = S
Indication		Planned duration		Start date			IV to Oral = O
							Oral to IV = V
Print NAME		Contact Number		Sign	Date / Pharm / Supply		Change drug = D
							Continue = C

Daily Review - Document in notes.

Date	Day 1		Day 2		Day 3		Day 4		Day 5		Day 6		Day 7	
Time	Admin	Review Code	Admin	Review Code	Admin	Review Code	Admin	Review Code	Admin	Review Code	Admin	Review Code	Admin	Review Code
06														
08														
12														
14		Sign		Sign		Sign		Sign		Sign		Sign		Sign
18														
22														

Daily ward round tools for must do's: STACO – Staph aureus, Thromboembolism, Antibiotic, Cannula, Oxygen Tick off when done S☑ T☑ A☑ C☑ O☑

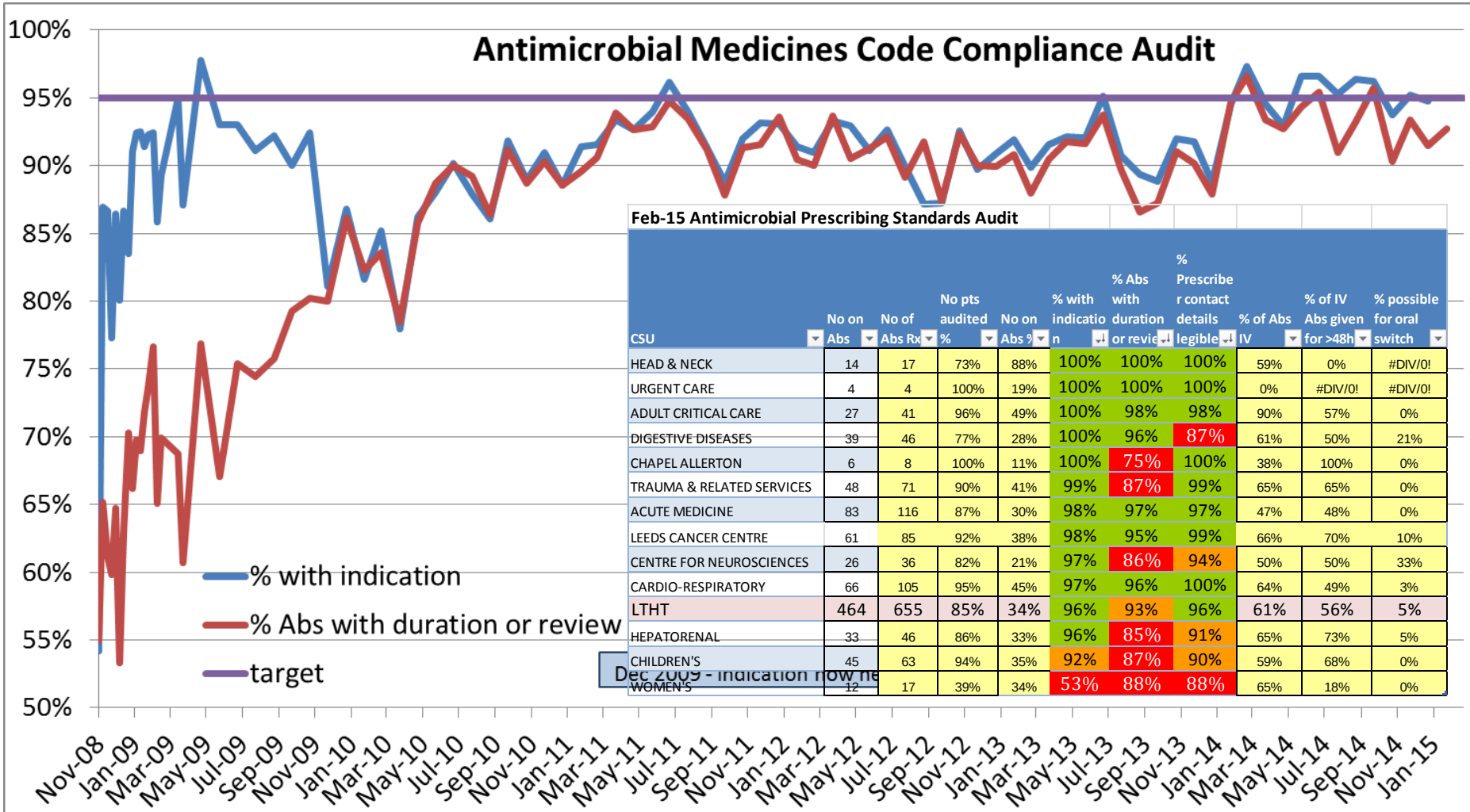
E-Whiteboard to help board rounds



Electronic systems for AMS

- Hosp e-Rx is poor (9%) + ind^{n} + dur^{n} ~34%
- Data warehousing (2%) - links pathology & pharmacy systems to PAS
- Can use data warehousing without e-Rxing if issue antibiotics to patients
  - Bug – no drug. Drug – no bug
  - Reporting systems of use & resistance
  - Increases productivity by 50% of AMS staff
  - Big savings on antibiotics & improved outcomes
- Apps: microguide, Ignaz, etc – no diagnosis?

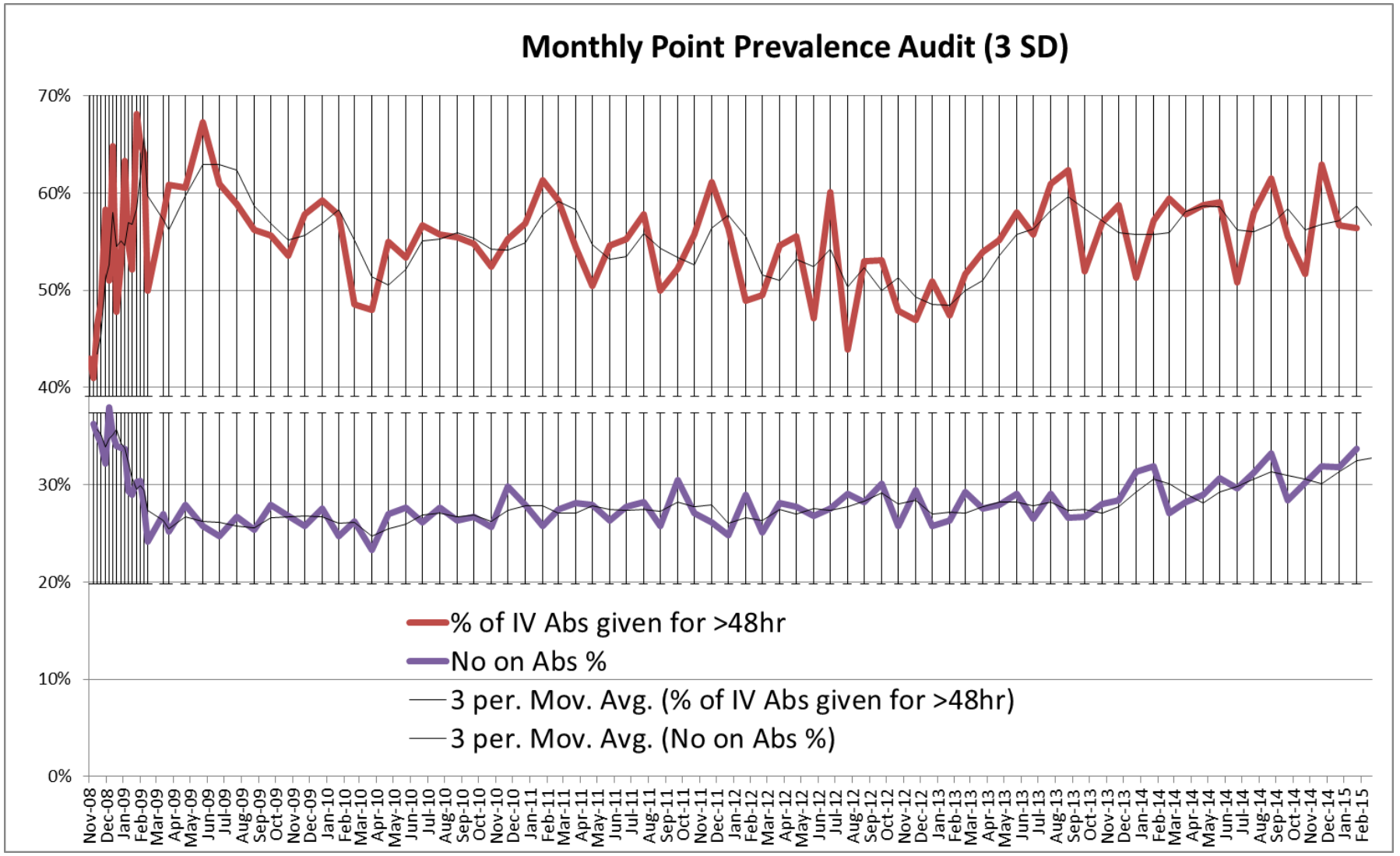
Indication & duration on Rx with feedback



Feb-15 Antimicrobial Prescribing Standards Audit

CSU	No on Abs	No of Abs Rx	No pts audited %	No on Abs %	% with indication	% Abs with duration or revie	% Prescriber contact details legible	% of Abs IV	% of IV Abs given for >48h	% possible for oral switch
HEAD & NECK	14	17	73%	88%	100%	100%	100%	59%	0%	#DIV/0!
URGENT CARE	4	4	100%	19%	100%	100%	100%	0%	#DIV/0!	#DIV/0!
ADULT CRITICAL CARE	27	41	96%	49%	100%	98%	98%	90%	57%	0%
DIGESTIVE DISEASES	39	46	77%	28%	100%	96%	87%	61%	50%	21%
CHAPEL ALLERTON	6	8	100%	11%	100%	75%	100%	38%	100%	0%
TRAUMA & RELATED SERVICES	48	71	90%	41%	99%	87%	99%	65%	65%	0%
ACUTE MEDICINE	83	116	87%	30%	98%	97%	97%	47%	48%	0%
LEEDS CANCER CENTRE	61	85	92%	38%	98%	95%	99%	66%	70%	10%
CENTRE FOR NEUROSCIENCES	26	36	82%	21%	97%	86%	94%	50%	50%	33%
CARDIO-RESPIRATORY	66	105	95%	45%	97%	96%	100%	64%	49%	3%
LTHT	464	655	85%	34%	96%	93%	96%	61%	56%	5%
HEPATORENAL	33	46	86%	33%	96%	85%	91%	65%	73%	5%
CHILDREN'S	45	63	94%	35%	92%	87%	90%	59%	68%	0%
WOMEN'S	12	17	39%	34%	53%	88%	88%	65%	18%	0%

Prevalence of AB & IV AB >48h



Day 3 review sticker for notes

Start date of antibiotic therapy: / / 2007	Date of review: / / 2007
Review of initial **diagnosis**	Significant **bacteriological results**
Antibiotic plan Agent: Route of administration: Dosage: Dosing interval: Planned total duration: days	
If the patient receives iv antibiotic, is an **oral switch** possible? □ Yes □ No □ Not applicable (not on iv)	Give the reason for that choice:

Figure 2. Sticker used to improve documentation of the measures in the medical notes.

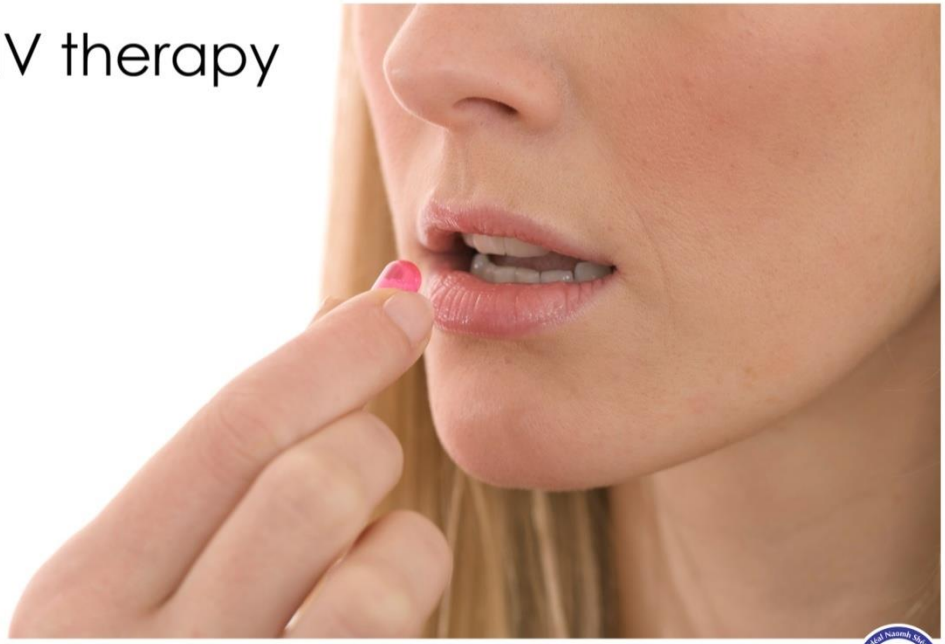
Pulcini JAC 2008 **61** 1384-88

Intravenous to Oral Antimicrobial Switch Strategy

Consider switch to oral antimicrobial therapy

- Reduce length of hospital stay
- Reduce adverse effects of IV therapy
- Improve patient comfort
- Save nursing time
- Reduce costs

Let's GO PO



SJH Antimicrobial Stewardship Committee

Antimicrobial treatment & prophylaxis guidelines

- Primary care – standard set of guidelines
- Secondary care – mixed picture
  - (inter)national guidelines "too detailed" and need a summary
  - BNF – no evidence base shown
  - NICE guidelines – limited
- How well are they followed? Do you know? 85% do
- Time for standard range of hospital guidelines, tailored to local resistance patterns?

SSTF: Antimicrobial guidelines

Most contain:

- Treatment (100%)
- Empirical choice (100%)
- Alternatives (99%)
- Route (99%)
- Dose (97%)
- Duration (96%)
- Prophylaxis (84% all)

Less commonly

- Where no AB needed (76%)
- Diagnosis (64%)
- Investigations (62%)
- Renal dosing (61%)
- Antibiogram (48%)
- Obesity dosing (27%)

Improving diagnosis is more than a list of antibiotics
Most smart phone Apps don't do this!

Guideline template

Leeds Health Pathways

Primary and Secondary Care Working Together

Guidelines TSD Referral Pathways Consultants

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Search again?

Title: **Cellulitis and Necrotising Fasciitis in Adults** Status: **CURRENT** Guideline/policy number: **1597** Ratified by Trust approved process? - **YES**

Publication date: 01/08/2009 | Last review: | Next review: 01/08/2012 | Ownership: Leeds Teaching Hospitals NHS Trust

view provenance | evidence base | view guideline stats | comment on this document

Guideline for the management of cellulitis and necrotising fasciitis in adults

- **Summary**
  Click here to print a Quick Reference Guide
- **Background**
- **Diagnosis**
- **Investigation**
- **Treatment**
  - Non-Antimicrobial Treatment
  - Empirical Antimicrobial Treatment
  - Directed Antimicrobial Treatment
  - Duration of Treatment
  - Switch to oral agent(s)
  - Treatment Failure

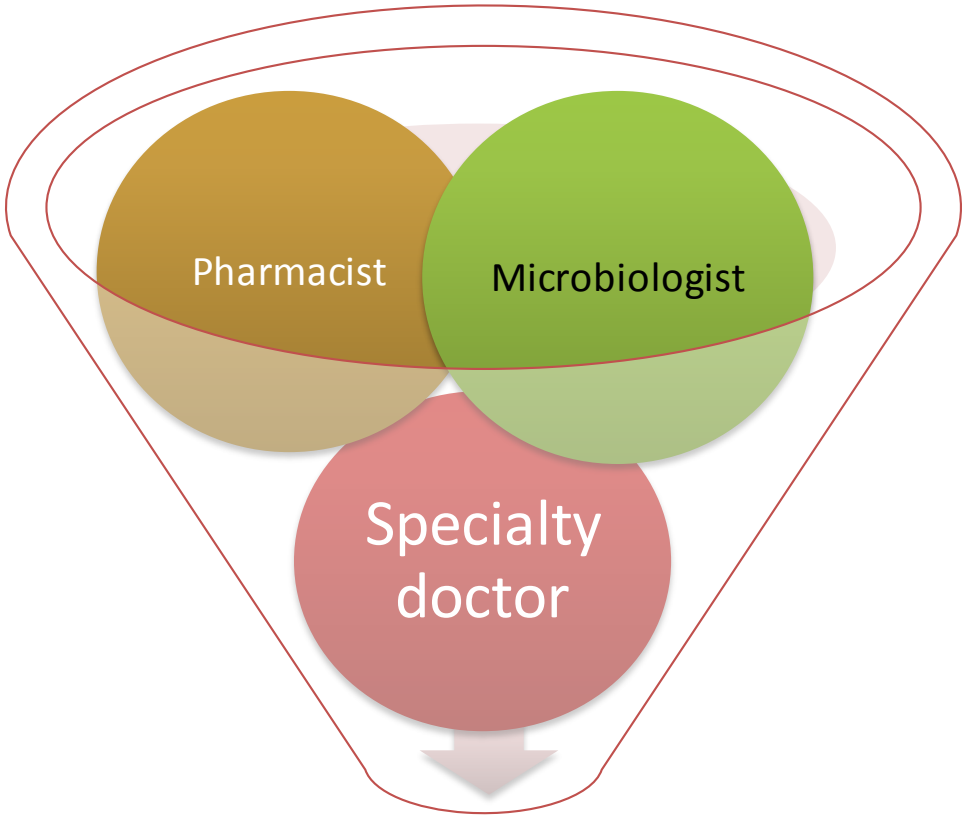
Quick Links

- Table 1. Empirical inpatient intravenous antimicrobial regimens.
- Table 2. Empirical community intravenous antimicrobial regimens
- Table 3. Empirical oral antimicrobial regimens
- Table 4. Recommended directed antimicrobial regimens.

- **Treatment Algorithm**

Summary
Cellulitis and Necrotising Fasciitis in Adults

Guideline development that improves use



Draft guideline for peer review

Get the end user to develop them & gain consensus

- Template
- Review evidence
- Draft document
- Peer review (4/52)
- Address comments
- Approval
- Publication onto Leeds Health Pathways on NHS spine

Comment on guidelines in use

Title: **Hospital Acquired Pneumonia - (Non-ventilated Patients)** | Status: CURRENT | Ratified by Guidelines Committee? - YES

Publication date: 18/12/2008 | Last review: | Next review: 01/11/2011 | Ownership: Leeds Teaching Hospitals NHS Trust

view provenance | evidence base | view guideline stats - **NEW**

This is a Trust approved guideline, but comments from the users of this document are still welcome using the form below.

Comments will be sent to the author(s) prior to the 'Next Review' date.

However, please contact the author directly via email regarding any matters requiring urgent attention.

THIS COMMENT FORM IS NOT INTENDED FOR CLINICAL ADVICE - PLEASE CONTACT MICROBIOLOGY DIRECTLY ((0113) 39 23962 or via switchboard)

Please complete the form below and click the 'submit' button.

Comment

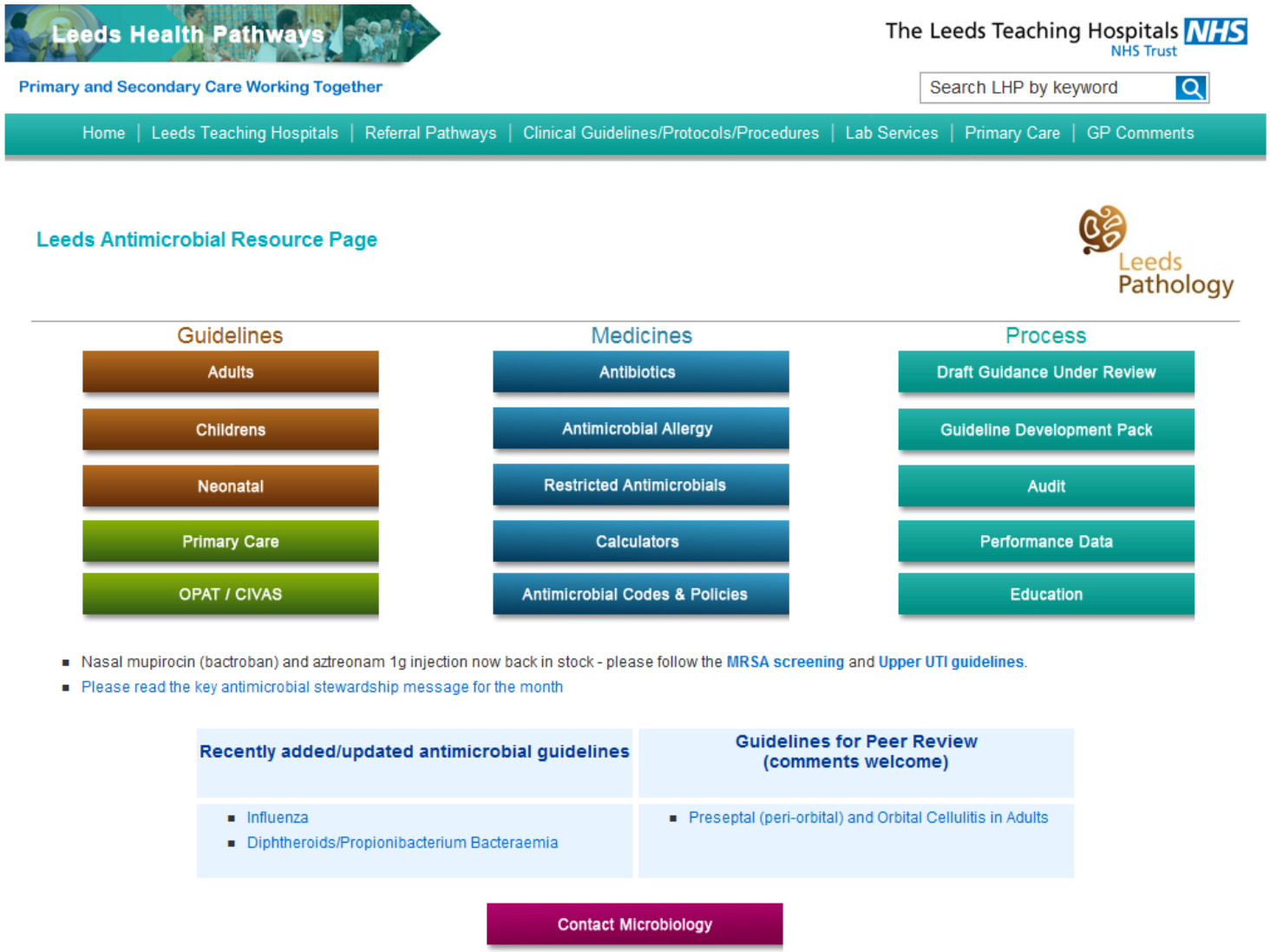
Staff Group
- Doctor ○
- Pharmacist ○
- Nurse ○
- Other ○

Name

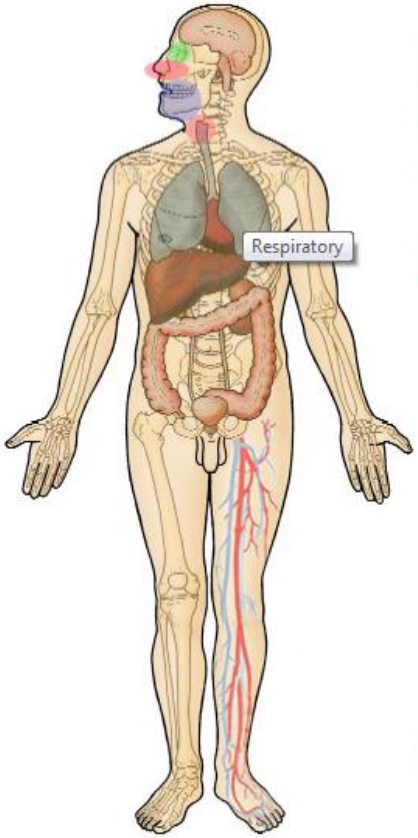
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Central antimicrobial hub



Need to easily find what is needed



Search by keyword Search

Adult by Specialty | Adult Prophylaxis

Severe / Neutropenic Sepsis | Antifungal Therapy

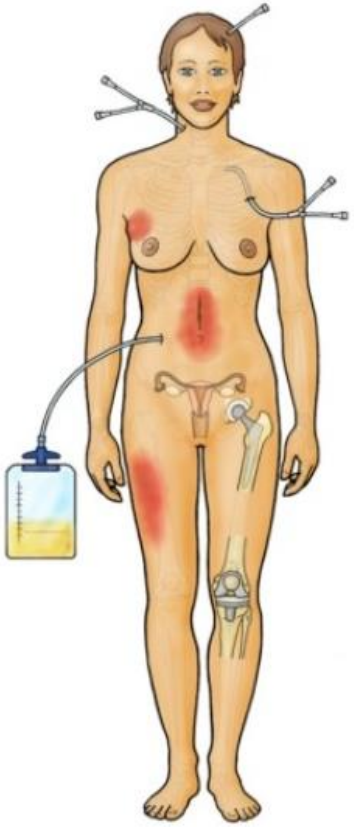
Bacteraemia Guidelines

Respiratory Treatment Guidelines

- Acute Exacerbation of Chronic Obstructive Pulmonary Disease
- Aspiration pneumonitis and aspiration pneumonia
- Bronchiectasis- Acute Exacerbation
- Community Acquired Pneumonia
- Cystic Fibrosis in Children and Adults
- Hospital Acquired Pneumonia
- Infected Parapneumonic Effusions and Empyema
- Influenza
- Lung Abscess in adults
- Mycobacterium Abscessus Respiratory Tract Infections in Children and Adults with Cystic Fibrosis
- Pulmonary fungal disease (including aspergillosis) in the Immunocompetent adult
- Varicella (Chicken Pox) Infection in Adults
- Ventilator-associated pneumonia

Respiratory Prophylaxis Guidelines

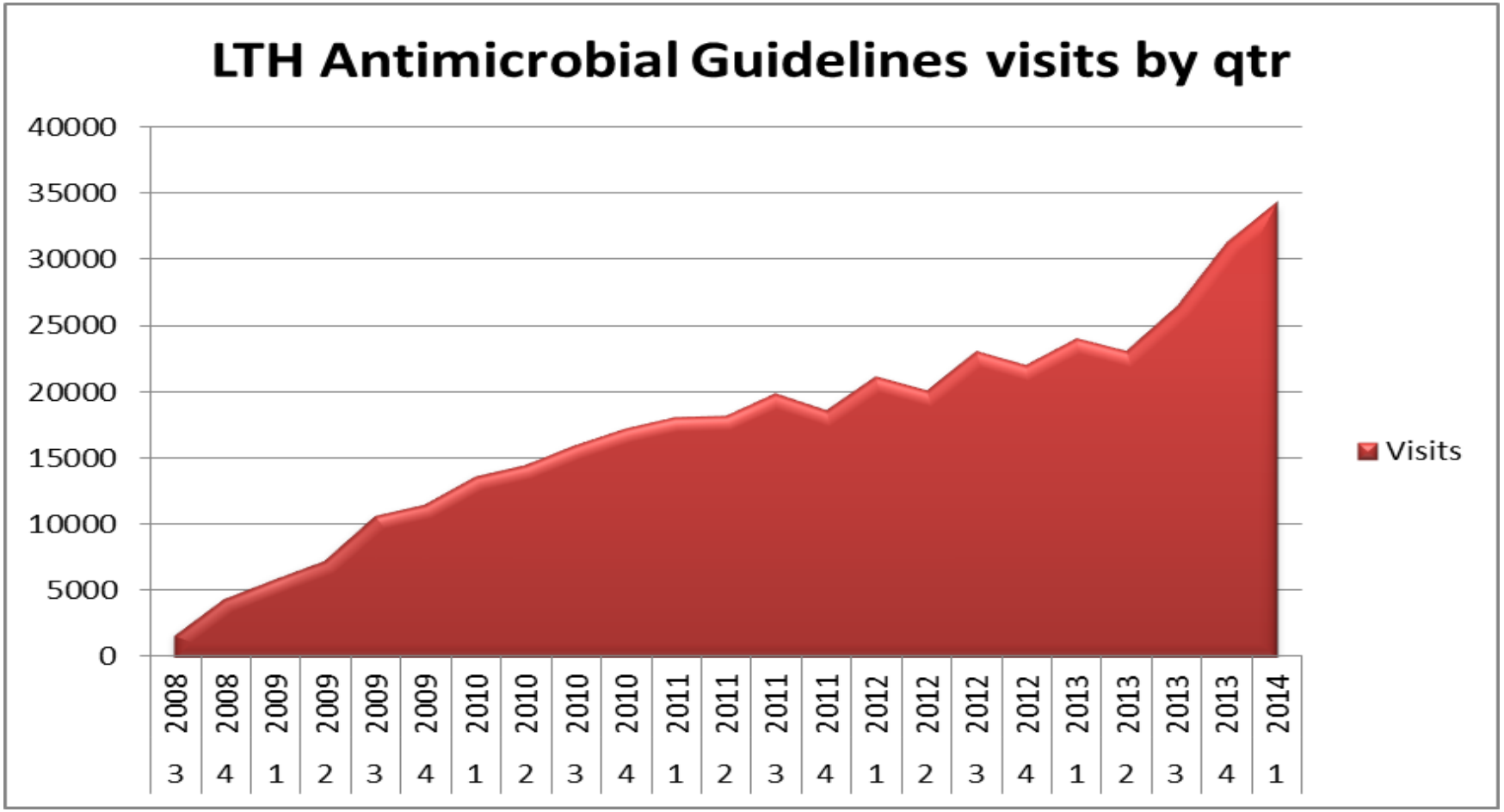
- Thoracic Surgery



Simple to use

Procedure	Recommendation for antibiotic prophylaxis	Evidence level	Prophylaxis intended to reduce	NNT	Antimicrobial dose/route ≤ 1 hours before procedure or tourniquet application	
					Routine*	MRSA risk# or penicillin allergic*
Oesophageal surgery	Recommended	D [1,3]	Wound infection		Co-Amoxiclav (Amoxicillin-Clavulanate) EMC 1.2g IV single dose	##Teicoplanin EMC 400mg IV & Gentamicin 2mg/kg IBW & Metronidazole EMC IV 500mg - all single dose
Stomach & duodenal surgery	Recommended	A [1,3]	Wound infection	5	Co-Amoxiclav (Amoxicillin-Clavulanate) EMC 1.2g IV single dose	##Teicoplanin EMC 400mg IV & **Gentamicin** 2mg/kg IBW & Metronidazole EMC IV 500mg - all single dose
Gastric bypass surgery	Recommended	D [1,3]	Wound infection		Co-Amoxiclav (Amoxicillin-Clavulanate) EMC 1.2g IV single dose	##Teicoplanin EMC 400mg IV & Gentamicin 2mg/kg IBW & Metronidazole EMC IV 500mg - all single dose
Small intestinal surgery	Recommended	D [1,3]	Wound infection		Co-Amoxiclav (Amoxicillin-Clavulanate) EMC 1.2g IV single dose	##Teicoplanin EMC 400mg IV & Gentamicin 2mg/kg IBW & Metronidazole EMC IV 500mg - all single dose
Appendicectomy	**Highly** recommended	A [1,3]	Wound infection Intra-abdominal abscess	11 103	Follow Appendicitis treatment guideline	Teicoplanin EMC 400mg IV plus Appendicitis treatment guideline
Colorectal surgery	**Highly** recommended	A [1,3]	Wound infection Intra-abdominal sepsis	4	Co-Amoxiclav (Amoxicillin-Clavulanate) EMC 1.2g IV single dose	##Teicoplanin EMC 400mg IV & **Gentamicin** 2mg/kg IBW & Metronidazole EMC 500mg IV single dose
Bile duct surgery	Recommended	A [1,3]	Wound infection	11	Co-Amoxiclav (Amoxicillin-Clavulanate) EMC 1.2g IV single dose	##Teicoplanin EMC 400mg IV & Gentamicin 2mg/kg IBW & Metronidazole EMC IV 500mg - all single dose
Pancreatic surgery	Recommended	D [1,3]	Wound infection		Co-Amoxiclav (Amoxicillin-Clavulanate) EMC 1.2g IV single dose	##Teicoplanin EMC 400mg IV & Gentamicin 2mg/kg IBW & Metronidazole EMC IV 500mg - all single dose
Liver surgery (excluding transplant)	Recommended	D [1,3]	Wound infection		Co-Amoxiclav (Amoxicillin-Clavulanate) EMC 1.2g IV single dose	##Teicoplanin EMC 400mg IV & Gentamicin 2mg/kg IBW & Metronidazole EMC IV 500mg - all single dose
Gall bladder (open or laparoscopic) in inpatients	Recommended	A [1,3] D [1,3]	Wound infection	11	Co-Amoxiclav (Amoxicillin-Clavulanate) EMC 1.2g IV single dose	##Teicoplanin EMC 400mg IV & Gentamicin 2mg/kg IBW & **Metronidazole** EMC IV 500mg - all single dose

Consensus based guidelines = use



nww.lhp.leedsth.nhs.uk/antimicrobials

Tailoring antimicrobial guidelines to CDI risk

Frequently

- Cephalosporins (broad spectrum)
- Clindamycin
- Fluoroquinolones
- Broad spectrum penicillins (incl co-amoxiclav)
- Carbapenems
- Monobactams

Occasionally

- Macrolides
- Trimethoprim
- Cotrimoxazole

Duration over 7 days equates to much higher risk of any antibiotics

Rarely

- Metronidazole
- Vancomycin
- Aminoglycosides
- Nitrofurantoin
- Tetracyclines
- Rifampicin

- Avoid high risk antibiotics in high risk patients eg cephalosporins in over 65s
- Diversity is good – reduces risk of resistance (squeezing the balloon)
- Antimicrobial allergy – improve history taking = less high risk antibiotics
- Avoid starting if possible with better diagnostics eg procalcitonin

Brown 2013 AAC

Penicillin allergy as a risk factor for MRSA, VRE & *Cl difficile* infection

- Prevalence of penicillin allergy in hospitalised patients:
  - General hospital population = **6%** (of 369k pts)
  - VRE = **24%** (100/426)
  - MRSA = **12%** (524/4438)
  - Cdiff = **16%** (31/186)
  - P<0.05 for all values
- Linked to use of vancomycin, quinolones & cephalosporins

Reddy Abstract 603 AAAAI 2013 Annual meeting

Allergy – get it right

- ~10-25% patients claim allergy but 85-90% have –ve skin tests & tolerate penicillins
- Higher mortality with allergy label Charneski Pharmacotherapy 2011
  - 1.4x↑ ITU admission, 1.6x↑ dying, 1.6X↑ >1 AB
- More expensive Irawati J Pharm Pract Res 2006; 36: 286-90
- Alternatives have more s/e
- Part of medicines optimisation:
  - Algorithm to elucidate those with true IgE allergy & treatment options

Is there a problem with non beta-lactam alternatives in penicillin allergy?

- Gram positive cover
  - Vancomycin – poorer outcomes for *Staph aureus* infections, VRE, nephrotoxicity
  - Clindamycin – link to *C.difficile* infection
  - Macrolides – interactions, arrhythmias, sudden death
  - Doxycycline – no licensed IV form
  - Linezolid & daptomycin – cost, interactions
- Gram negative cover
  - Fluoroquinolones - *C.difficile* infection, arrhythmias, tendonopathy, acute kidney injury
  - Aminoglycosides – renal impairment, deafness
  - Aztreonam – manufacturing problems
  - Tigecycline – last line (Pfizer) 1%↑ mortality, cost

Are there new risks for the penicillin allergic patient?



- MHRA Drug Safety Update (Sept 2012) on levofloxacin
  - Not 1st line in sinusitis, CAP, AE chronic bronchitis
  - serious hepatotoxicity, cardiac arrhythmia, severe skin reactions and tendon rupture
- Increased CV mortality with clarithromycin in COPD (Schembi BMJ 2013)
  - 12 Scottish hospitals showed 1.5x↑ CV events up to 12 months later. Not seen with β-lactams or doxycycline, or in CAP
- Azithromycin and sudden CV death (Ray NEJM 2012)
  - Excess deaths 47 per million courses. Levofloxacin slightly less but no effect seen with amoxicillin
- Increasing *Strep pneum* resistance to macrolides / doxy

NICE Drug Allergy Clinical Guideline

- Allergy status on ALL GP letters, hospital discharges AND prescriptions. Not happened yet!
- Check and update drug allergy status, confirm with them or carers before prescribing, dispensing or administering ANY drug
- Drug allergy records: name, nature & date occurred, NKDA or unable to ascertain (to be corrected ASAP). Part of Meds Rec
- Patient info to be carried at all times
- Refer to allergy service:
  - where can only use β-lactam
  - high likely need for future AB for recurrent infections or immunodeficiency
  - allergy to βL and another AB class

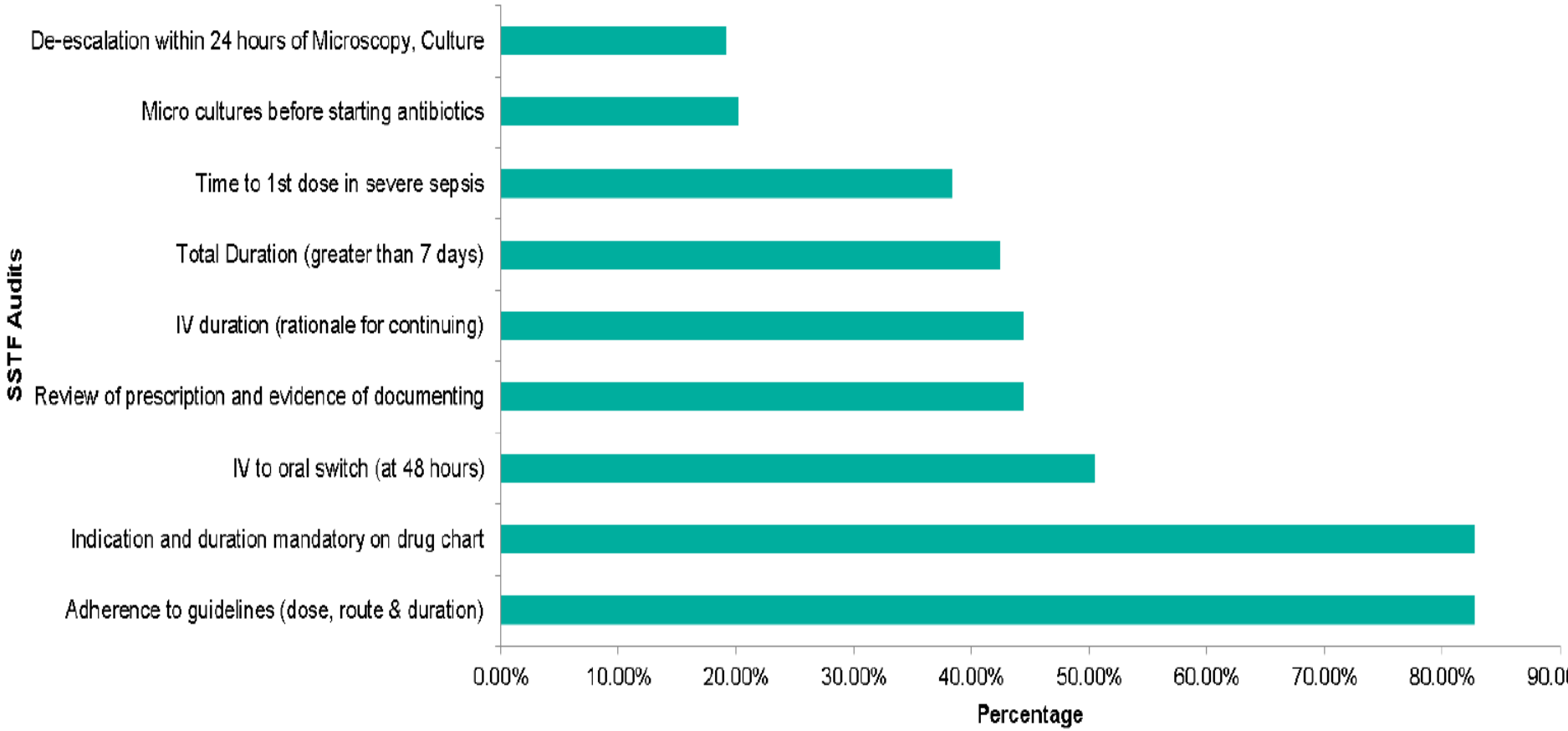
Prophylaxis against CDI

- Probiotics prophylaxis:
  - Not supported in HPA 2008 CDI
  - Not to be used for treatment (Cochrane 2008) except possibly non severe recurrent disease in elderly
  - **Cochrane 2013** – moderate effect in CDI 13 trials (961pts) 12.6% vs 12.7% RR = 0.89 CI 0.64-1.24
  - **PLACIDE** (Allen 2014) RCT in>65yr on AB. PB 12/1470 (0.8%) vs 17/1471 (1.2%) got CDI. AAD 10.8% vs 10.4% NS & not cost effective
- Antibiotic prophylaxis
  - Metronidazole: doesn't work. Vancomycin does but resistance
  - Doxycycline could possibly protect from ceftriaxone induced CDI
  - Rifampicin possibly has protective effect as combination agent

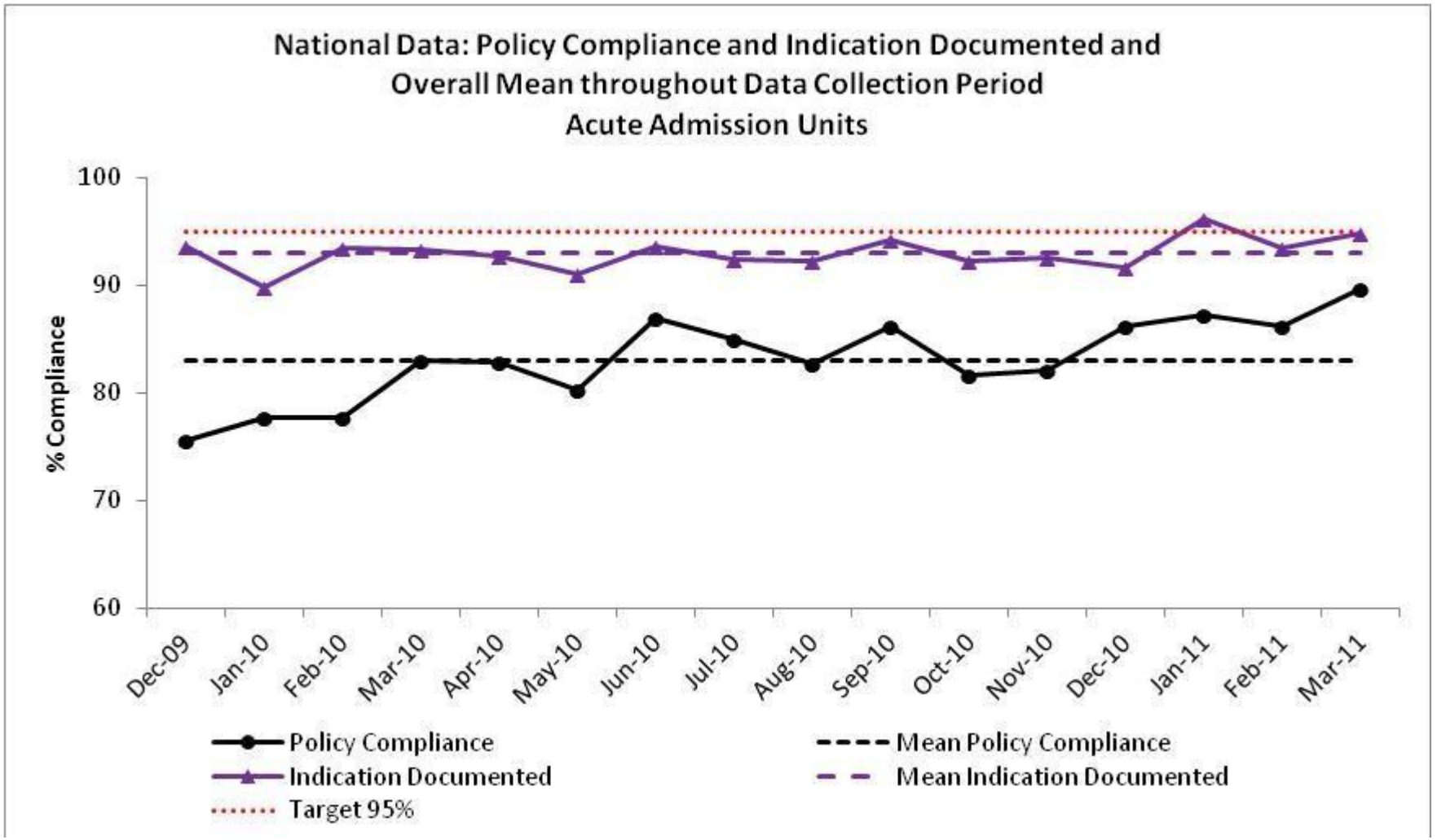
Hickson BMJ 2007, Plummer Int Microbiol 2004, Johnson Ann Int Med 1992, Doernberg CID 2012

Audit & feedback to improve prescribing

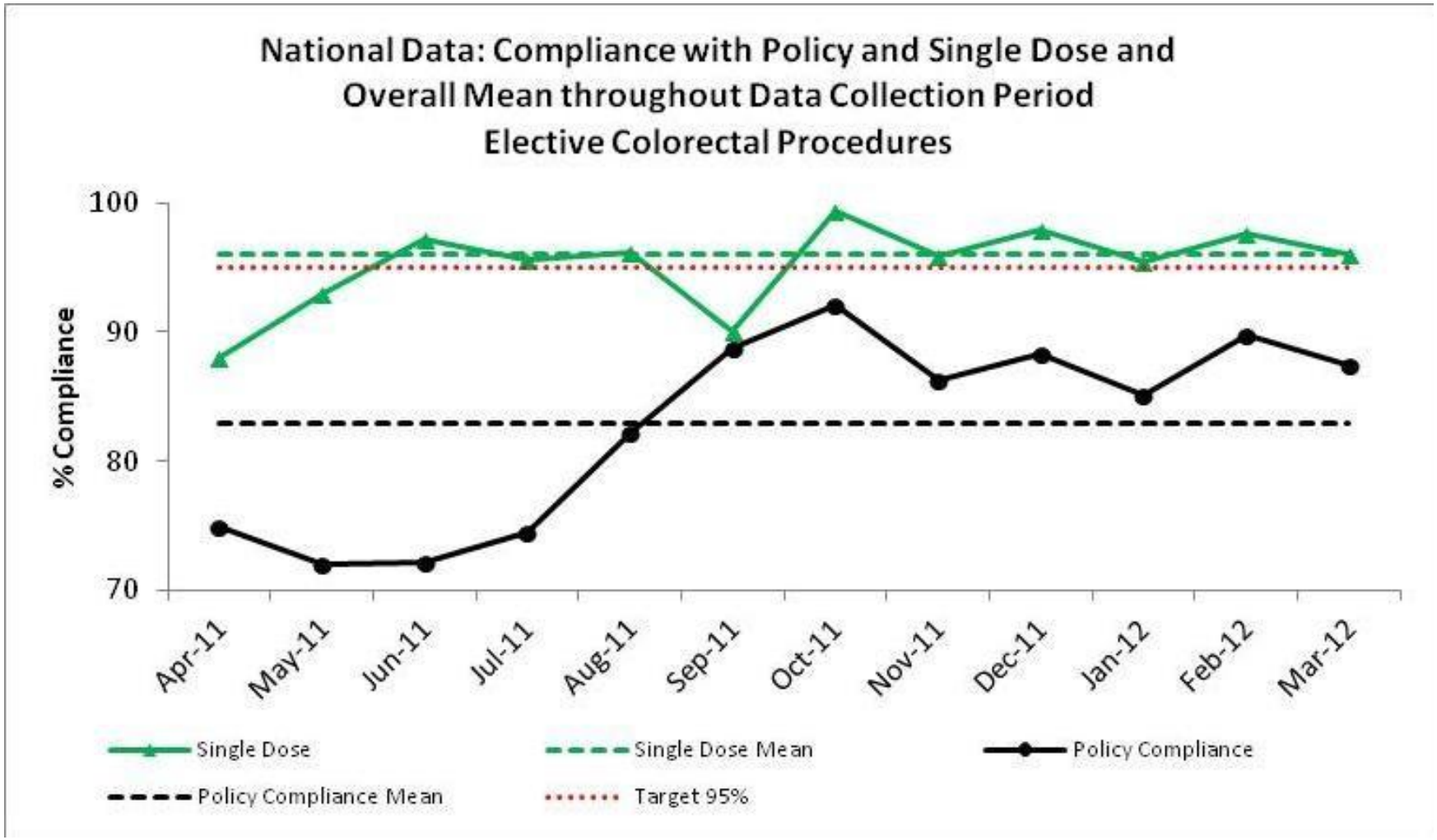
Figure 4.7 Proportion of Trusts who have implemented audits recommended by SSTF 2014, n=99



Quality improvement rather than annual audit cycle: Indication & compliance in acute med admission

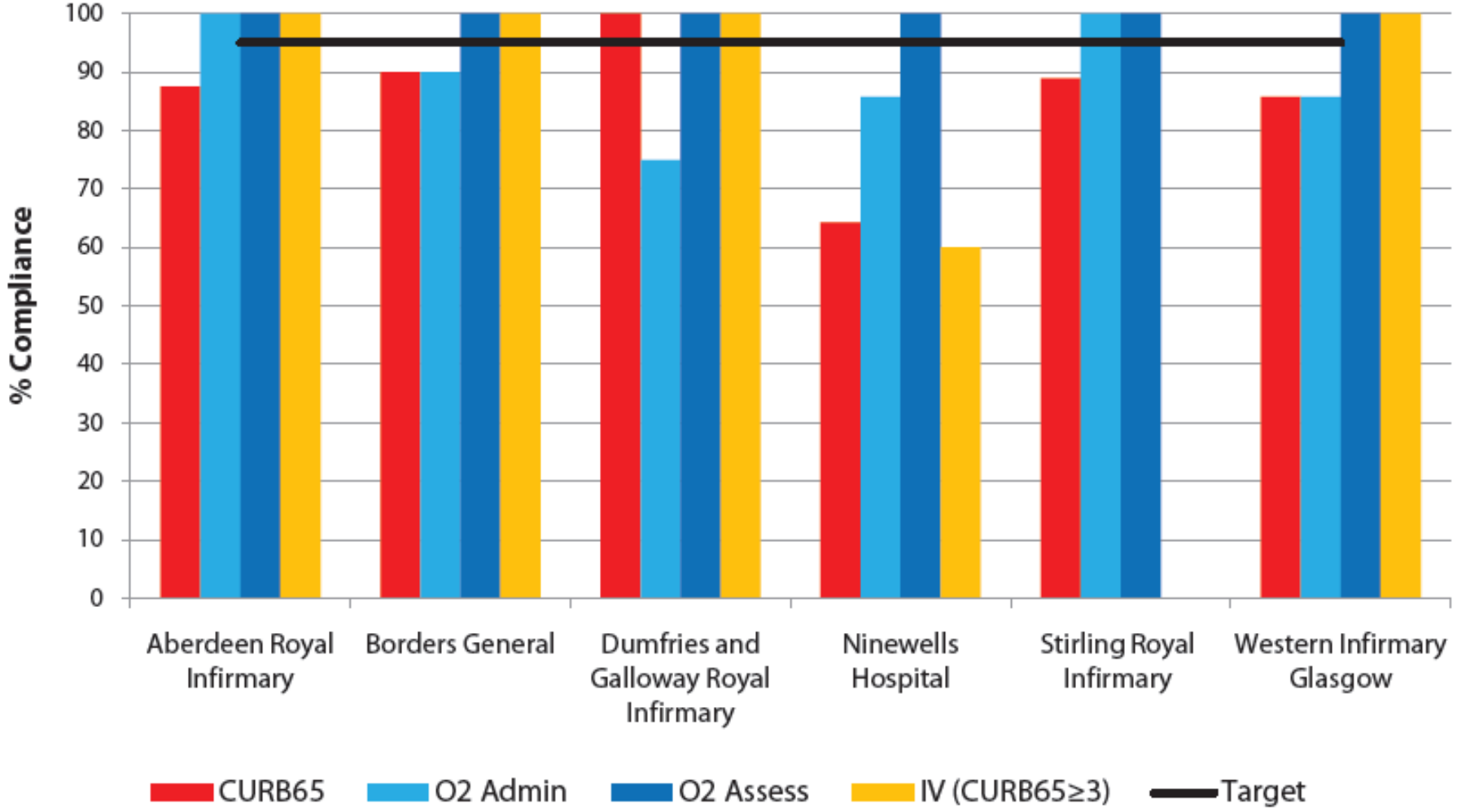


SAPG: SSI prophylaxis for colorectal



Audit of care bundles

SNAP-CAP Results 15 April 2011



Results far better than those recorded on BTS CAP audit

Approval systems

- Formularies: simple list → linked to treatment guidelines
- Drug & therapeutic committee review
  - Ideally linked to a guideline with an audit tool
- Approval systems
  - Rapid effect to decrease usage
  - Manual: telephone using codes , but errors
  - Automated: pre-approval by indication
  - Electronic: web-based system with follow up if not on approved list
- 1st or 2nd dose approval to ↓ time in severe sepsis
- Full or part-time: 24 hours / weekdays / daytime system
- Follow up of restricted supplies by pharmacy

Linkin 2006 ICHE; Aspinall 2007 AmJManagCar; Buising 2008 JAC; LaRosa 2007 ICHE; Kumar 2006 CCM

Restricted antibiotic report - anidulafungin example

	4443634	MNY3012B05	LIVER ABSCESS LINEZOLID	SUPP	01/01/2015 15:35	Mr Philip Howard
		AMC-CJW2812D05	LIVER ABSCESS COLOMYCIN	SUPP	01/01/2015 15:34	Mr Philip Howard
	0644166	MML0301D02	- fungaemia anidulafungin	ACT	05/01/2015 13:37	Mr Philip Howard
	0644166	MML0301D02	- fungaemia anidulafungin	ACT	05/01/2015 13:37	Mr Philip Howard
	4443634	MNY3012B05	LIVER ABSCESS LINEZOLID	SUPP	01/01/2015 15:35	Mr Philip Howard
		AMC-CJW2812D05	LIVER ABSCESS COLOMYCIN	SUPP	01/01/2015 15:34	Mr Philip Howard
	0403645					
	4443634	MNY3012B05	LIVER ABSCESS LINEZOLID	SUPP	01/01/2015 15:35	Mr Philip Howard
		AMC-CJW2812D05	LIVER ABSCESS COLOMYCIN	SUPP	01/01/2015 15:34	Mr Philip Howard
	4443634	MNY3012B05	LIVER ABSCESS LINEZOLID	SUPP	01/01/2015 15:35	Mr Philip Howard
		AMC-CJW2812D05	LIVER ABSCESS COLOMYCIN	SUPP	01/01/2015 15:34	Mr Philip Howard

Link restricted antimicrobials to indication and authorising Dr to make follow up easier

Pt Safety Alert: Sepsis

1. Staff have access to the tools
2. Make all staff aware of key messages – esp AB within 1 hour
3. Share local good practice or resources

- 40% have audited time to 1st dose

NHS England

Patient Safety Alert

Stage Two: Resources

Resources to support the prompt recognition of sepsis and the rapid initiation of treatment

2 September 2014

Alert reference number: NHS/PSA/R/2014/015

Alert stage: Two - Resources

This patient safety alert applies to all patient age groups

Sepsis is a time-critical medical emergency, which can occur as part of the body's response to infection. The resulting inflammatory response adversely affects tissues and organs. Unless treated quickly, sepsis can progress to severe sepsis, multi-organ failure, septic shock and ultimately death. Septic shock has a 50% mortality rate[1].

Sepsis is almost unique among acute conditions in that it affects all age groups and can present in any clinical area and health sector. Over 70% of cases arise in the community[2]. However, sepsis can be easily treated through timely intervention and basic, cost-effective therapies. Recent epidemiological studies[3],[4] and data from the Intensive Care National Audit and Research Centre (ICNARC)[5], estimate that 35,000 people die from sepsis in England each year. We are lacking in recent data, especially in the UK but the mortality rate for sepsis in children is estimated to be 10 – 15%. Key to reducing these figures are:

- Timely recognition and diagnosis of sepsis
- Fast administration of intravenous antibiotics
- Quick involvement of experts including intensive care specialists

It is estimated that the reliable delivery of basic elements of sepsis care could save 11,000 lives a year and £150 million annually[6]. This equates to 100 lives and £1.25 million in bed days for an average district general hospital each year. Furthermore, in 2010 the Centre for Maternal & Child Enquiries (CMACE) published the UK Confidential Enquiry into Maternal Deaths for the period 2006 – 2008 that found sepsis to be the commonest cause of direct maternal death[7].

This stage 2 alert has been issued to continue to raise awareness of sepsis and to signpost clinicians in the ambulance service, primary and community services and secondary care to a set of resources developed by the UK Sepsis Trust, and others, to support the prompt recognition and initiation of treatments for all patients suspected of having sepsis. These resources include the Sepsis 6, a care bundle whose use is associated with significant numbers of lives saved and reduced length of hospital stays[8].

The resources are available from here: UK Sepsis Trust's clinical toolkits

Actions

Who: Chief Executives of NHS Trusts, Foundation Trusts, Ambulance Trusts & General Practitioners

When: To commence immediately and by no later than 31 October 2014 have a robust action plan developed to achieve compliance

1. Ensure staff have access to both adult, paediatric and infant sepsis screening and action tools that can be used for patients presenting on first attendance, or developing suspected infection as an in-patient. Examples of such tools can be found at the resource links given in this alert.
2. By either circulating this alert or through local alternatives (such as newsletters, local awareness campaigns, etc.) ensure that all relevant staff are aware of the key messages and the linked resources (or local equivalents) so they can be introduced into clinical practice; in particular the administration of antibiotics within one hour of suspicion of sepsis and early escalation to senior medical management.
3. Share local good practice or further locally developed resources relating to sepsis via the deterioration page of the Patient Safety First website.

CLINICAL TOOLKITS

EMERGENCY MEDICINE TOOLKIT

Produced in collaboration with the College of Emergency Medicine, this toolkit provides operational solutions to ED sepsis recognition and management, with suggested standards.

SELECT YOUR PDF BELOW

- Emergency Medicine Executive Summary
- Emergency Medicine Screening
- Emergency Medicine Toolkit

GENERAL WARD TOOLKIT

The Royal College of Nursing have worked with us to produce this toolkit providing operational solutions to 'general ward' sepsis recognition and management, with suggested standards.

SELECT YOUR PDF BELOW

- General Ward Executive Summary
- General Ward Screening
- Clinical Ward Toolkit

AMBULANCE SERVICE TOOLKIT

Developed with the College of Paramedics. Frequently the first point of contact, this toolkit will help with design and delivery of prehospital sepsis recognition and management.

SELECT YOUR PDF BELOW

- Ambulance Service Executive Summary
- Ambulance Service Screening
- Ambulance Service Toolkit

ACUTE MEDICAL UNIT TOOLKIT

The Royal College of Physicians have worked with us to produce this toolkit aimed at Acute Medical Units and those working in them, with suggested standards.

SELECT YOUR PDF BELOW

- Acute Medical Unit Executive Summary
- Acute Medical Unit Screening
- Acute Medical Unit Toolkit

GENERAL PRACTICE TOOLKIT

We've collaborated with the Royal College of General Practitioners to produce this practical guide to and suggested standards for sepsis recognition and management in the community.

SELECT YOUR PDF BELOW

- General Practice Executive Summary
- General Practice Screening
- General Practice Toolkit

TOOLKIT APPENDICES

These documents are fully compatible with all of our clinical toolkits. They provide additional background information, further reading and practical suggestions for driving change.

SELECT YOUR PDF BELOW

- Red Flag Sepsis Appendix
- Implementing Change Appendix
- RCP News Appendix
- Human Factors Appendix

ACUTE PAEDIATRIC TOOLKIT

We'll be working on a full toolkit in the coming months followed by documents for specific clinical areas, but the Paediatric Sepsis Six is ready and available for use.

SELECT YOUR PDF BELOW

- Paediatric Sepsis 6

Community Pharmacy Toolkit in development

www.sepsistrust.org

National CQUIN 2015-6: sepsis

Two part indicator (worth 0.25%):

- 2a: The total number of patients presenting to emergency departments and other units that directly admit emergencies who met the criteria of the local protocol and were screened for sepsis.
- 2b: The number of patients who present to emergency departments and other wards/units that directly admit emergencies with severe sepsis, Red Flag Sepsis or Septic Shock (as identified retrospectively via case note review of patients with clinical codes for sepsis) and who received intravenous antibiotics within 60 minutes

ED Sepsis Screening Tool

Emergency Department Sepsis Screening and Action Tool

Sepsis is a time critical condition. Screening, early intervention and immediate treatment saves lives.
This tool should be applied to all adult patients who are not pregnant who have a suspected infection or their clinica
observations are outside of normal limits.

1. Are any 2 of the following present?

Temperature	> 38.3ºC or < 36ºC
Respiratory rate	> 20 per minute
Heart rate	> 90 per minute
Acute confusion/ reduced conscious level	
Glucose	> 7.7 mmol/l (unless DM)

N → Sepsis not present now.
Treat to standard protocols.
Review with WCC

Y

2. Could this be an infection?

For example:
Pneumonia
Urinary Tract Infection
Abdominal pain or distension
Meningitis
Cellulitis/ septic arthritis/ infected wound

N → **Sepsis present**
Inform responsible clinician.
Begin hourly observations.
Reassess for severe sepsis hourly*.
Ensure bloods for markers of severe sepsis are sent*.
Monitor urine output
Consider life threatening sepsis mimics e.g. Asthma.

Y

3. Is any red flag present?

Systolic B.P < 90 mmHg or MAP < 65 mmHg
Lactate > 2 mmol/l
Heart rate > 130 per minute
Respiratory rate > 25 per minute
Oxygen saturations < 91%
Responds only to voice or pain/ unresponsive
Purpuric rash

N → **Red Flag Sepsis**
This is a time critical condition, immediate action is required. Assume severe sepsis present.

Y

Sepsis Six
1 High-flow oxygen.
2 Blood cultures and consider source control.
3 Intravenous antibiotics.
4 Intravenous fluid resuscitation.
5 Check haemoglobin and serial lactates.
6 Hourly urine output measurement.
Record the time each of these actions is completed. All actions should be completed as soon as possible but always within 60 minutes.

Communication:
Inform senior clinician (e.g. registrar or above).

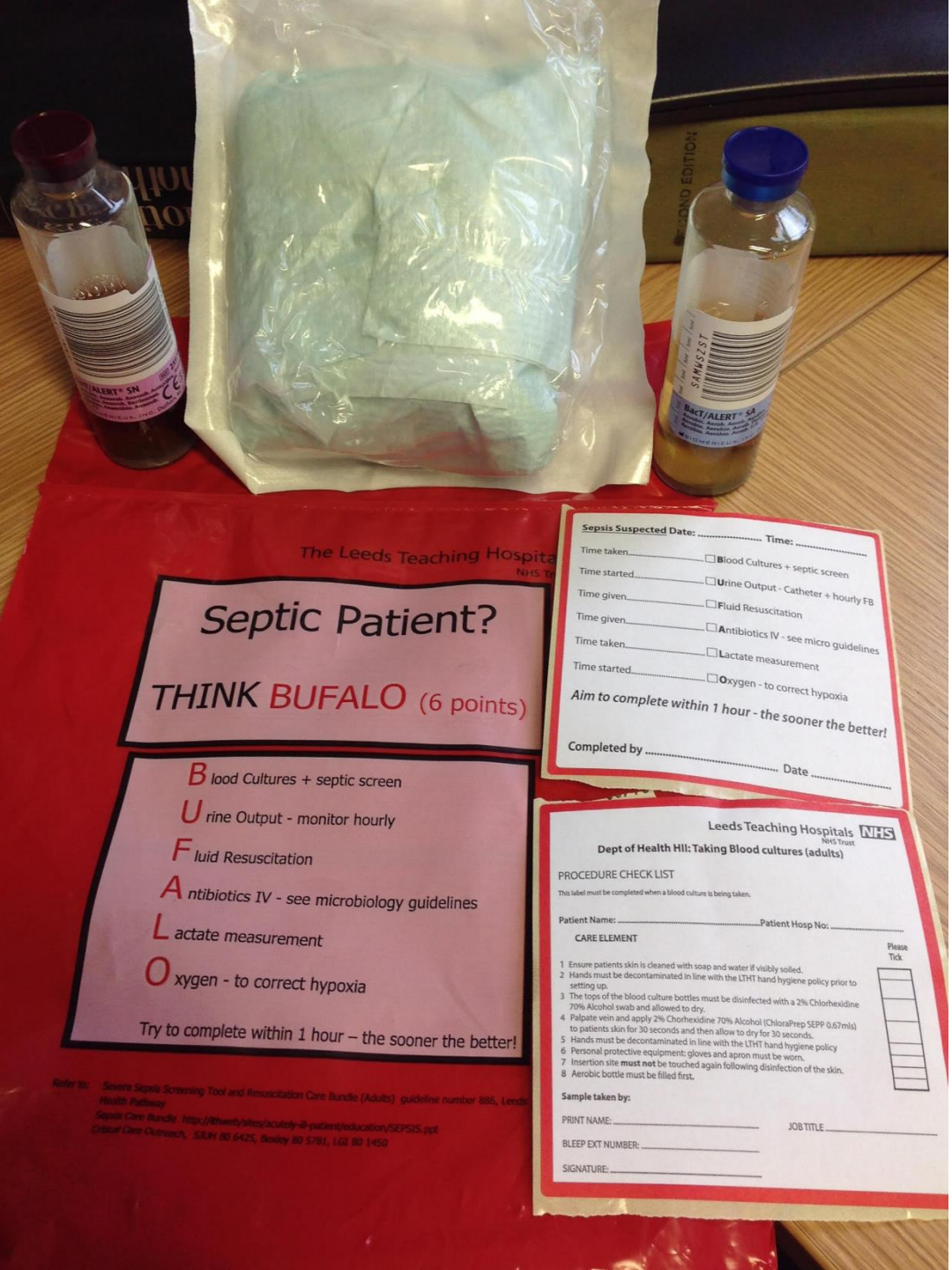
Additional:
Bloods should include: FBC, U/E's, LFT's, and clotting profile.
Observations should be taken every 30 minutes
Lactate should be repeated within 2 hours.
Perform a CXR and Urinalysis
Consider source control (e.g. surgical intervention)

The College of Emergency Medicine

THE UK SEPSIS TRUST

* = Bilirubin > 34 µmol/L, INR > 1.5, Lactate > 2 mmol/l, Platelets <100x10⁹/L , Creatinine >177 µmol/L

Sepsis Six pack Leeds THT version



Sepsis Suspected Date: ..... **Time:** .....

Time taken..... ☐ **B**lood Cultures + septic screen

Time started..... ☐ **U**rine Output - Catheter + hourly FB

Time given..... ☐ **F**luid Resuscitation

Time given..... ☐ **A**ntibiotics IV - see micro guidelines

Time taken..... ☐ **L**actate measurement

Time started..... ☐ **O**xygen - to correct hypoxia

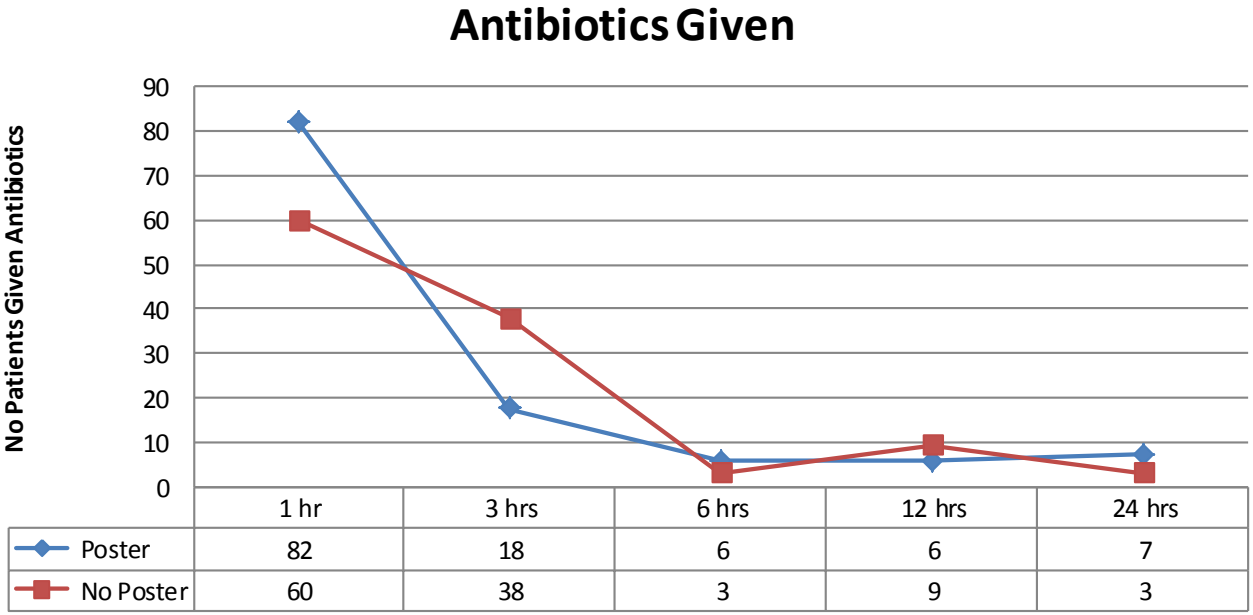
Aim to complete within 1 hour - the sooner the better!

Completed by ..... **Date** .....

Leeds THT critical care outreach audit
Impact of BUFALO poster



- 28 day survival
  - 78.4% with poster & 69.2% without
  - Antibiotics within 60 min = 83%, after 63%





Procalcitonin Guided Antibiotic Therapy

RTI Setting	Cold/Flu Primary Care	Bronchitis Emergency Room	Pneumonia Hospital	Sepsis ICU
Mortality	<<1%	<1-3%	5-20%	30-70%
AB-Initiation↓	75%	40%	14%	0%
Duration ↓			12→5d	10→6d
AB exposure↓	75%	40%	64%	40%

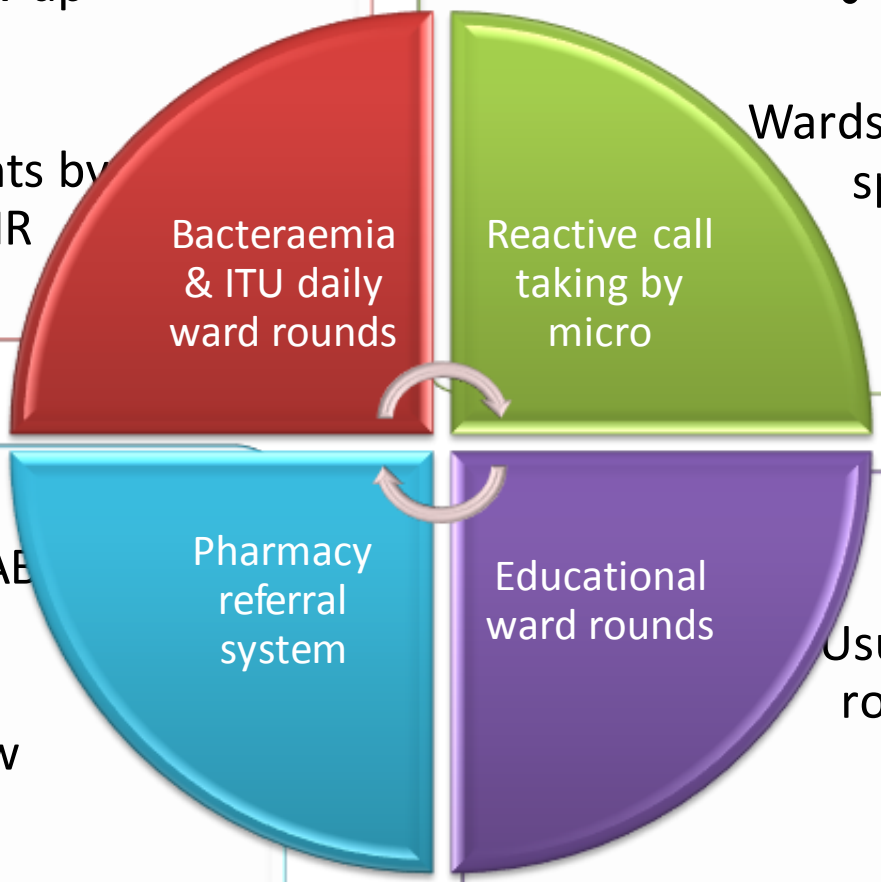
The less antibiotic exposure, the less antibiotic resistance!

Christ-Crain et al., Lancet 04
Christ-Crain et al., AJRCCM 06 & 08
Stolz et al., CHEST 07
Nobre, AJRCCM 07
Briel et al., Arch Int Med 08
Schütz et al., JAMA 09
Stolz et al., ERJ 2010
Bouadma, Lancet 2010

Thanks to Susan Hopkins

Models of delivering AMS

- Proactive follow up of bacteraemic patients
- Complex patients by specialty or AMR



- Comprehensive guidelines

Wards ring for patient specific advice to micro or ID

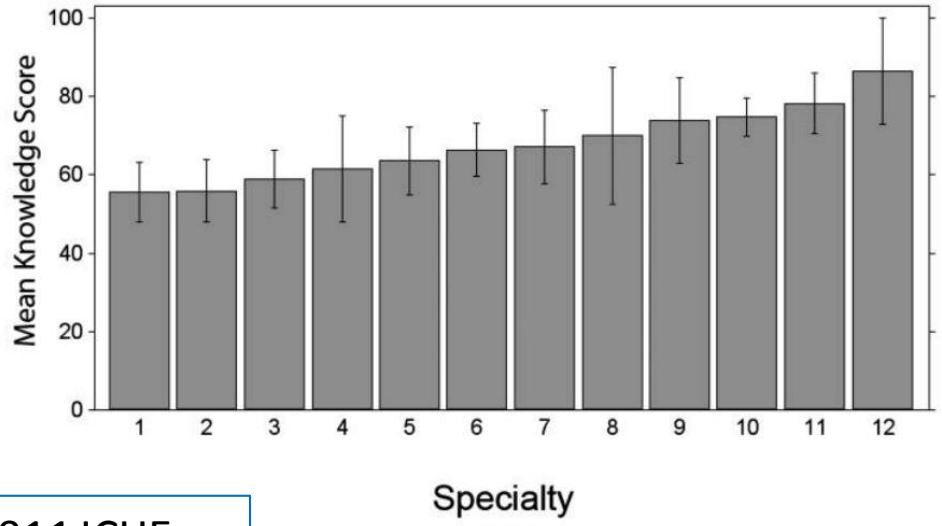
- Patients on IV AB > 5 days or 48h
- Restricted antibiotic follow up
- Antimicrobial audits

Usually weekly ward rounds with clinical team

- Audit meeting presentations

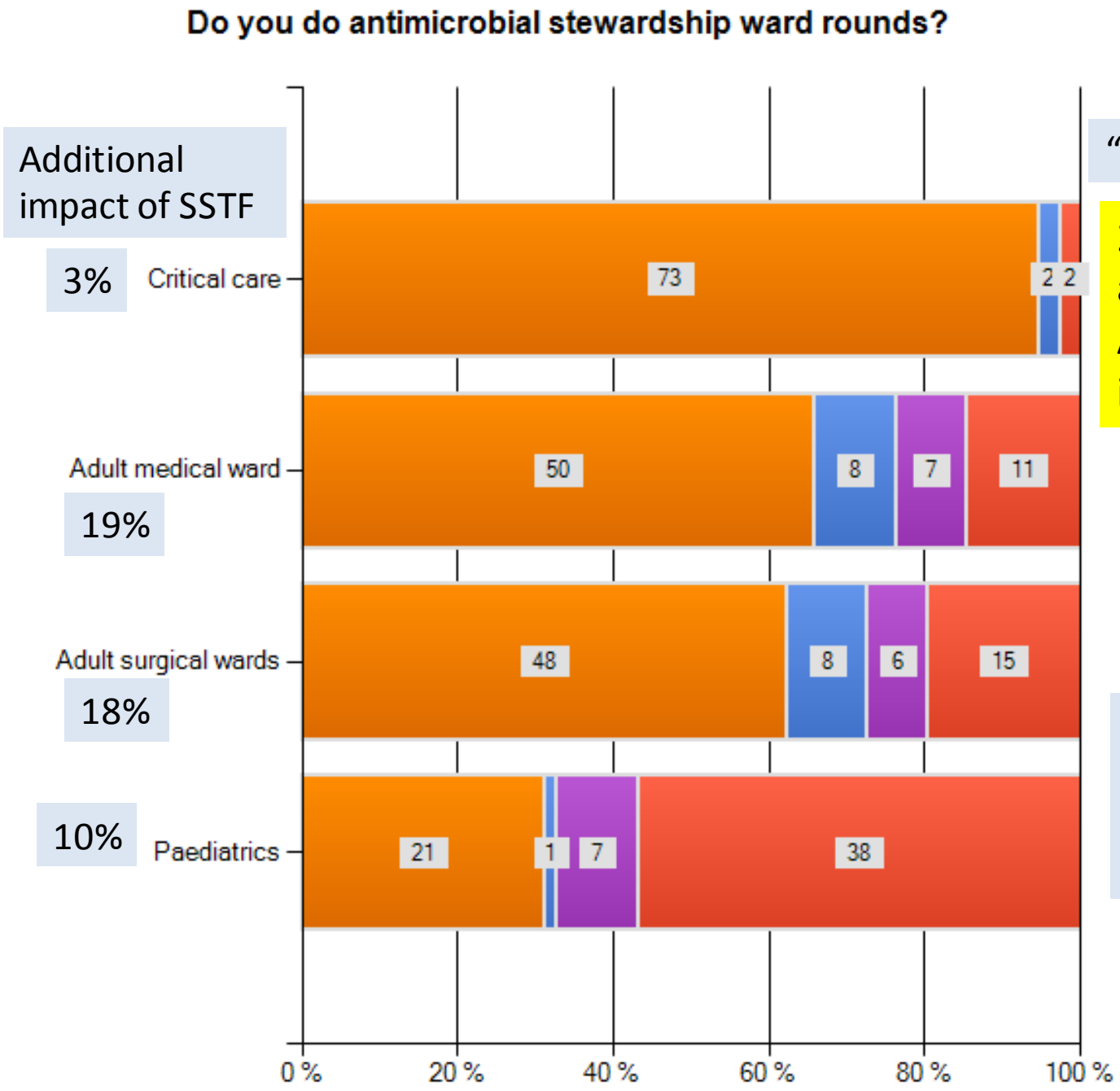
Which specialty should we target for AMS?

- Complexity of patients? ITU, haematology, renal, liver?
- Mortality rate of specialty: elderly, emergency medicine
- Highest antibiotic users?
- Lower AMS knowledge of specialty: surgery
- Everywhere – using local available resources
- Laggards – low %, hard work



Specialty:
1 Surgical Subspecialties
2 Physical Medicine and Rehabilitation and others
3 Anesthesiology
4 Obstetrics and Gynecology
5 Pediatrics
6 Internal Medicine sub-specialties
7 Orthopedics
8 Emergency Medicine
9 General Surgery
10 Internal and Family Medicine
11 Critical Care
12 Infectious Diseases

Abbo 2011 ICHE



Additional impact of SSTF

3%

19%

18%

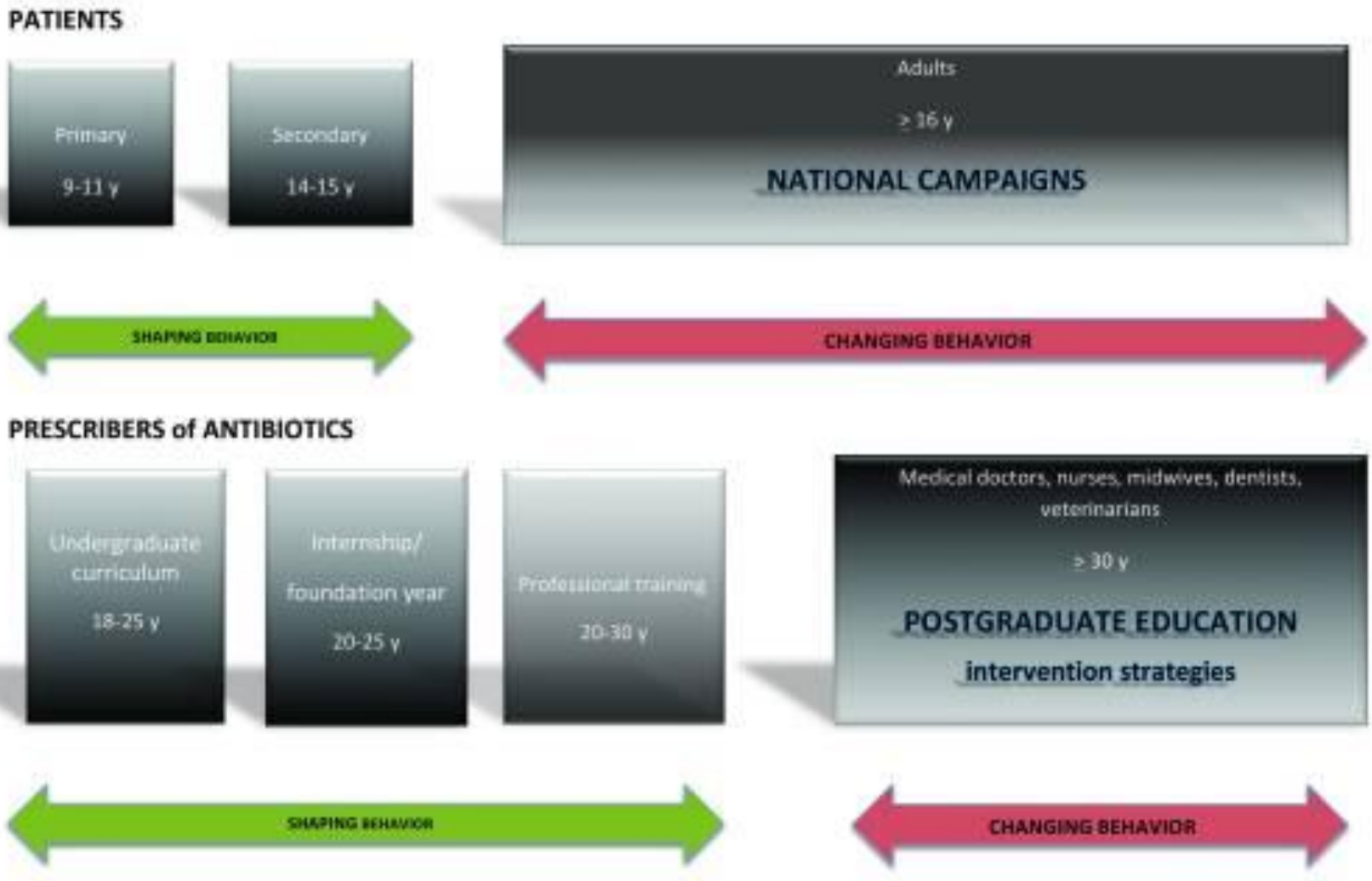
10%

"… admission wards …"

27% ↓ & 10% ↑ antibiotic use since AMS round introduction

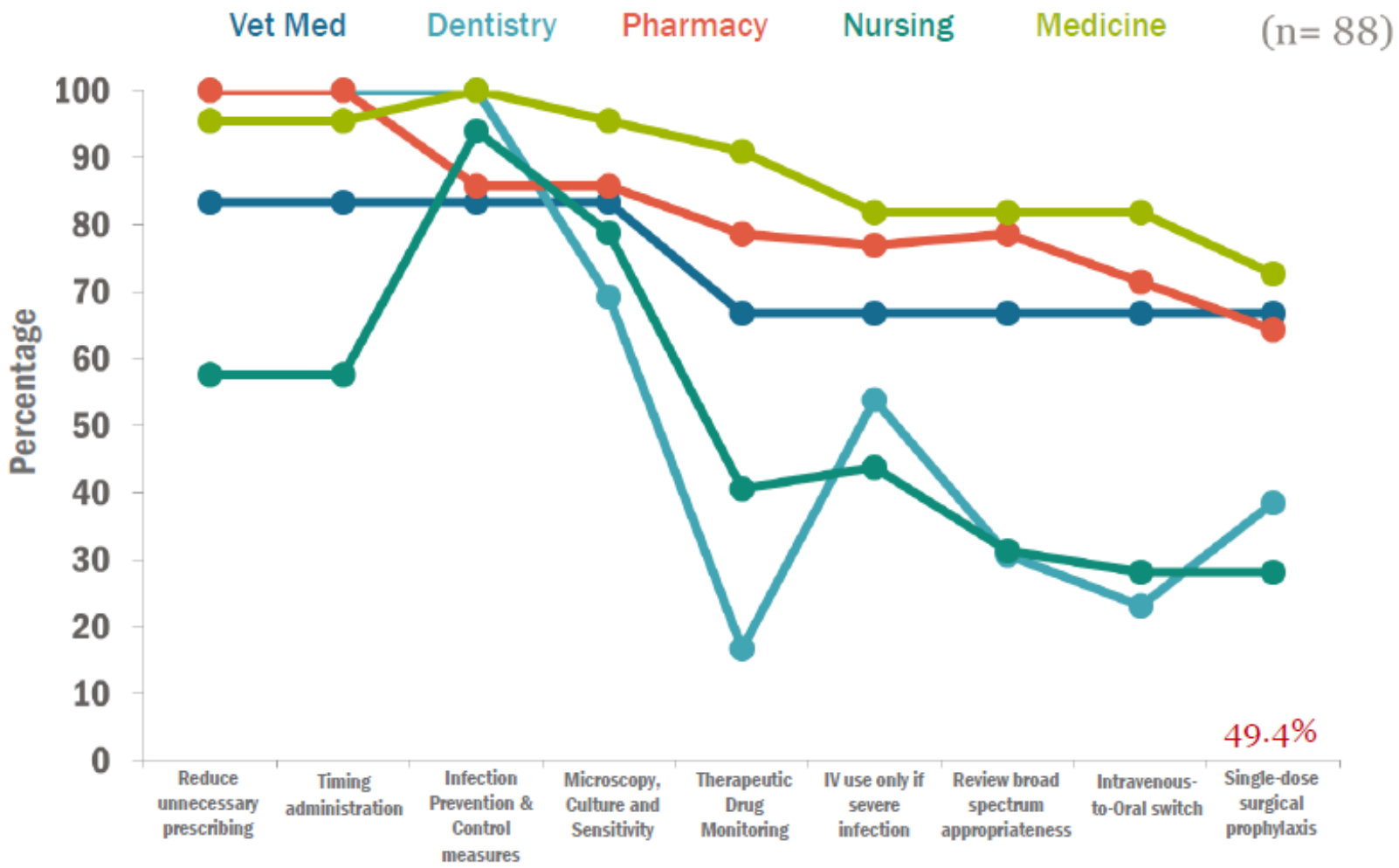
"surgical and medical subspecialties, I do 8 rounds per week across the hospital"

AMS Education will improve



Need to improve diagnosis by junior doctors – education ward rounds

Undergraduate AMS teaching



(Imperial 2014)

UK 5yr AMRS+SSTF: Education & Training

- Doctors, nurses & pharmacists
- Specifically cover antibiotics linked to CDI
- Nursing education should focus on:
  - Avoiding missed doses
  - Prompt sampling for C&S
  - Questioning therapies where no duration or those that do not meet guidelines
- Face to face, e-learning, etc. Lectures don't work
- Don't forget locums

Antimicrobial Prescribing and Stewardship Competencies

Public Health England

ARHAI
Department of Health
Expert Advisory Committee on Antimicrobial Resistance and Healthcare Associated Infection

Antimicrobial prescribing and stewardship competencies

1. Infection prevention and control
2. Antimicrobial resistance and antimicrobials
3. Prescribing antimicrobials
4. Antimicrobial stewardship
5. Monitoring and learning

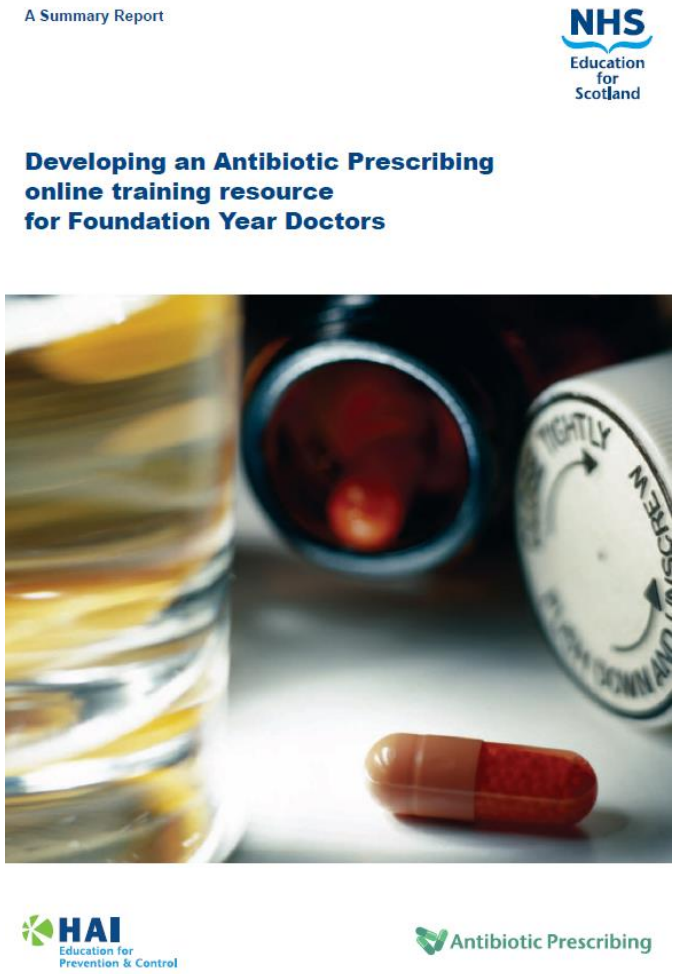
Health Education England: New mandatory framework for education and training on AMR & AMS in 2015-6 for all healthcare staff at undergraduate and post-registration levels

Table 4.4 Reported education and training initiatives from Acute trusts, n=99

Education and Training Initiaves	Percent
Trust has a written Antimicrobial Education and Training Strategy	24%
Competency assessments	
carried out for prescriber	22%
are mandatory	20%
All doctors on induction receive	
antibiotic guidelines	63%
antibiotic guidelines and a lecture/in person training on antimicrobial prescribing	66%
antibiotic guidelines and need to do an e-learning module on antimicrobial prescribing	21%
Teaching on induction for	
all nurses	28%
all pharmacists	72%
non-medical prescribers	20%
Mandatory e-learning for	
senior doctors (registrar and higher)	16%
junior doctors	21%

ESPAUR 2014

Scottish AMS Education



Junior doctors

- Introductory element
- FY must do 3 of 4 vignettes
- Pass mark is 60% - redo if fail

Senior doctors & GPs

Pharmacists

Nurses

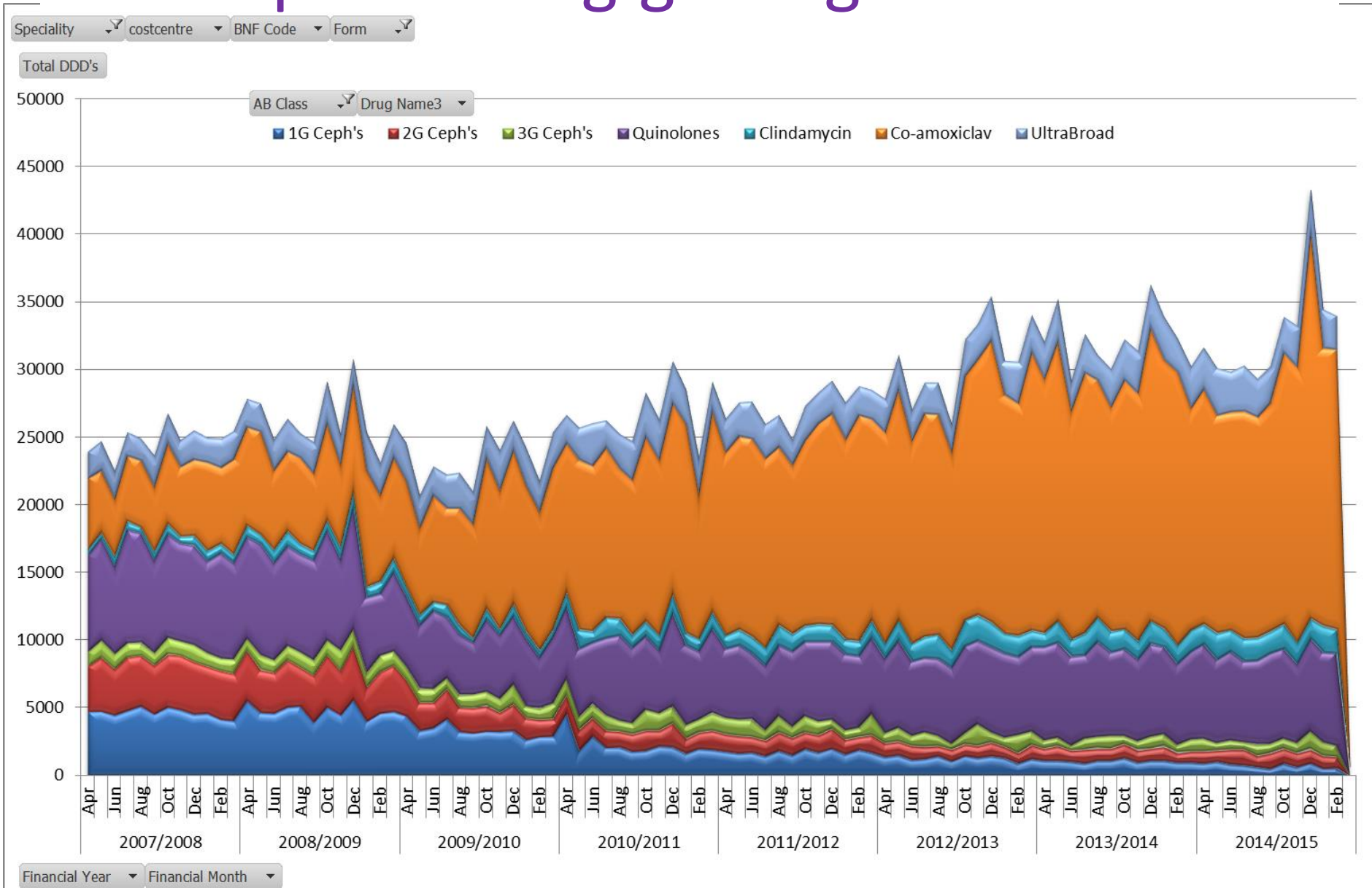
- Range of other courses

- BSAC MOOC from Sep-15

Antimicrobial usage measurement

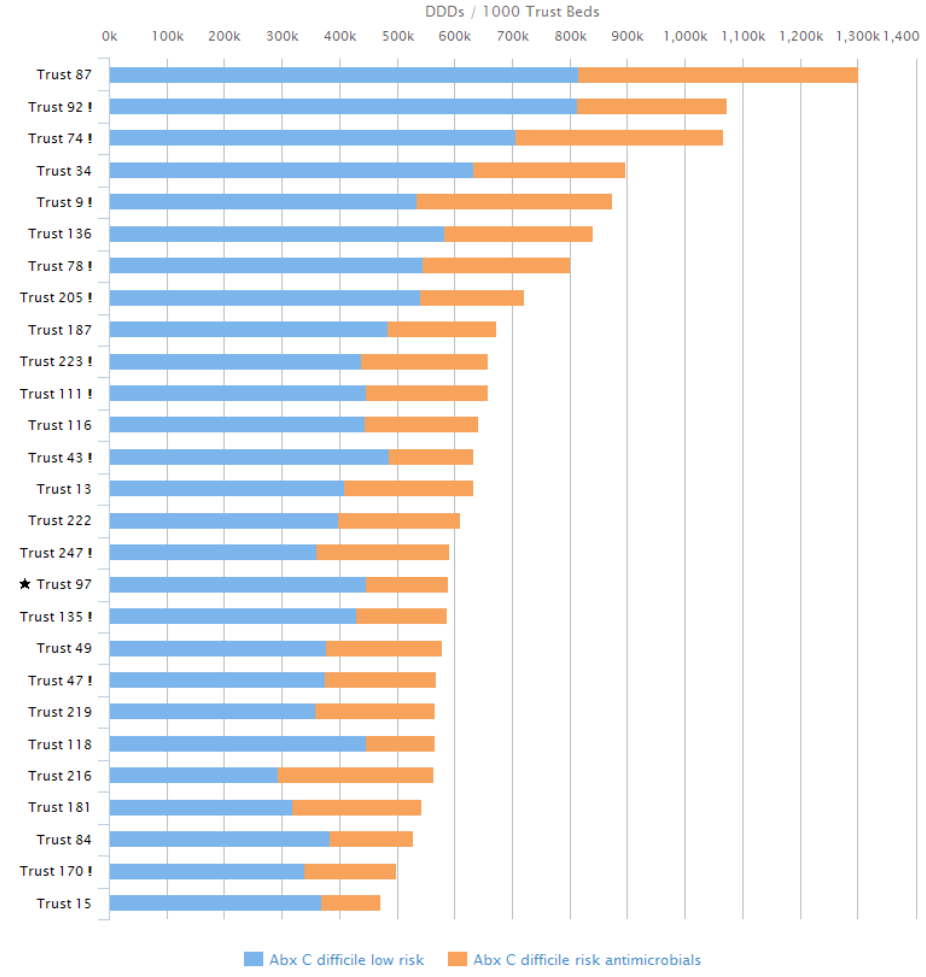
- **No hospital level data ever at a national level**
- Defined daily doses (WHO assigned values) allows comparison of different Abs
  - Doesn't work well when mix changes (as in UK)
- Per occupied bed day (usually >95%)
- Per finished consultant episode (lag in data)
- Per 1000 beds is easier
- Rx-Info Define system used by 65%+ of Acute Trusts can help to benchmark with similar hospitals

Is my broad spectrum antibiotic prescribing getting better?



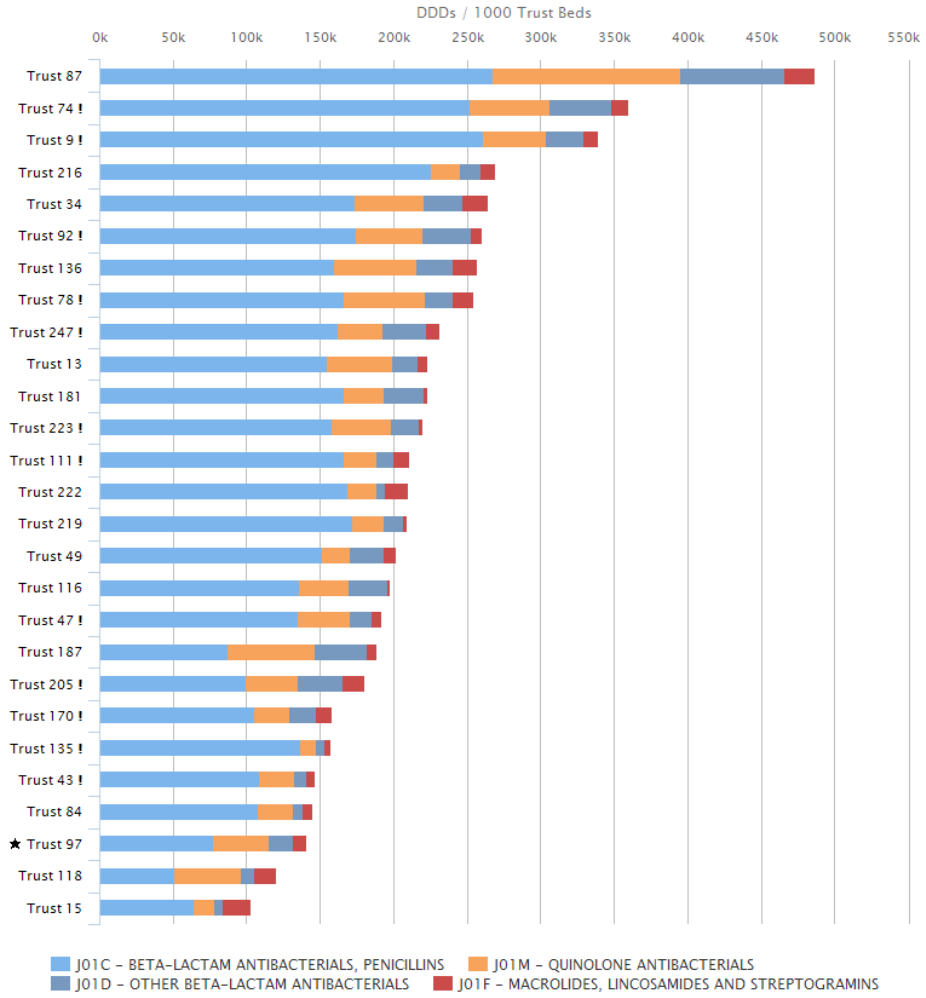
Tertiary centre comparison 2014
Total AB & high CDI risk (per1000 beds)

Date Range: Jan 2014 - Dec 2014. **Trusts**: National - Similar Type and Size. **Drugs**: Tag: Abx C difficile low risk - Antibiotics with low or medium Clostridium difficile risk, Abx C difficile risk antimicrobials - Antibiotics with higher Clostridium difficile risk. **Specialties**: 226 of 229. **Prescription Types**: All



Filter Summary

Date Range: Jan 2014 - Dec 2014. **Trusts**: National - Similar Type and Size. **Drugs**: Tag: Abx C difficile risk antimicrobials - Antibiotics with higher Clostridium difficile risk. **Specialties**: 226 of 229. **Prescription Types**: All

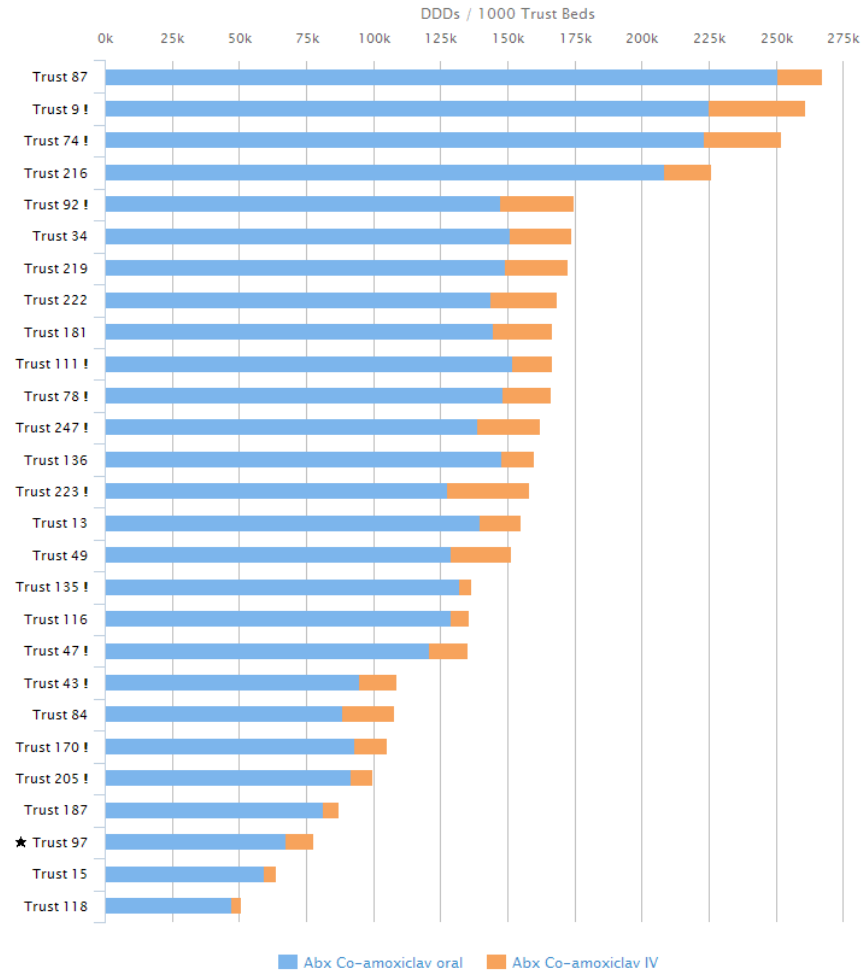


Tertiary centre comparison 2014

CoAmoxiclav or Pip-tazo + carbapenem (per1000 beds)

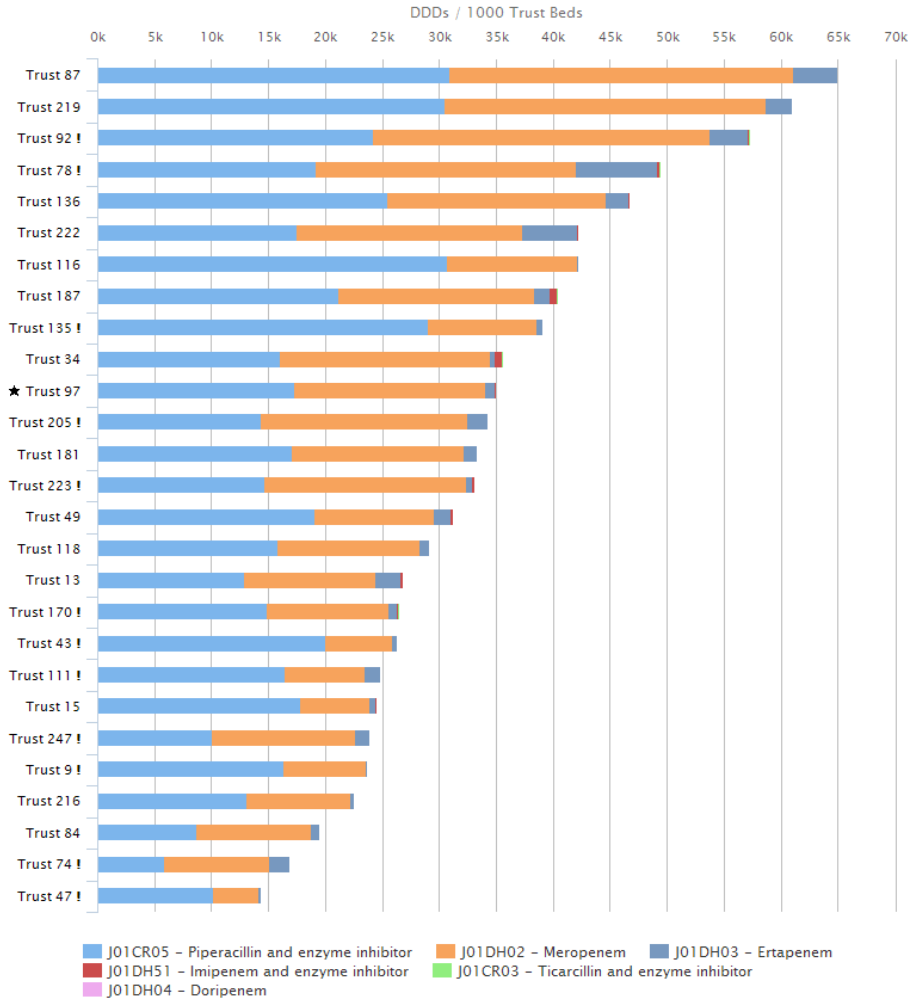
Filter Summary

Date Range: Jan 2014 - Dec 2014. **Trusts**: National - Similar Type and Size. **Drugs**: Tag: Abx Co-amoxiclav IV - Co-amoxiclav IV preparations, Abx Co-amoxiclav oral - Co-amoxiclav oral preparations. **Specialties**: 226 of 229. **Prescription Types**: All



Filter Summary

Date Range: Jan 2014 - Dec 2014. **Trusts**: National - Similar Type and Size. **Drugs**: Tag: Abx Ultra Broad Spectrum - Antibiotics - Tazocin, Timentin and Carbapenems. **Specialties**: 226 of 229. **Prescription Types**: All



Performance data – make it simple

NHS England

Summary of Higher risk HCAI antibiotics for December 2014

Antimicrobial Prescribing Standards	CSU	LTH	ADULT CRITICAL CARE (42)	ACUTE MEDICINE (18)	CARDIO-RESPIRATORY (22)	NEUROSCIENCES (34)	CHAPEL ALLERTON (20)	CHILDREN'S (14)	D
Indication in notes or chart		95%	93%	98%	99%	94%	100%	82%	
Duration or review date on chart		93%	91%	97%	100%	94%	88%	82%	
Prescriber identifiable		94%	93%	92%	96%	100%	100%	94%	
Overall performance		😐	😐	😐	☺	😐	☹	☹	

AB usage to Dec-14	LTH	ADULT CRITICAL CARE (42)	ACUTE MEDICINE (18)	CARDIO-RESPIRATORY (22)	NEUROSCIENCES (34)	CHAPEL ALLERTON (20)	CHILDREN'S (14)	D
Total - short term (3mth vs last yr)	10%	21%	24%	5%	57%	8%	5%	
Broad spectrum - short term (3mth vs last yr)	6%	16%	17%	8%	25%	-28%	-6%	
Total - long term (12mth vs last yr)	3%	5%	-2%	0%	1%	7%	-1%	
Broad spectrum - long term (12mth vs last yr)	3%	6%	-6%	3%	-1%	-5%	-2%	
AB usage	☹	☹	😐	☹	☹	😐	😐	

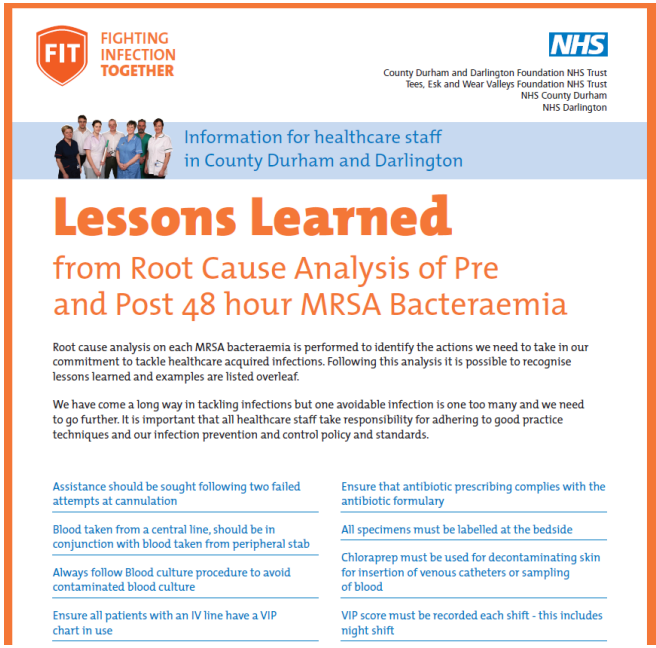
Effective communication to all is key

- Most difficult strategy. Multifaceted approach needed
- Hierarchical dissemination through IPC meetings, E-mail (overload), newsletters, slides for audit meetings, screen-savers, texting (good for doctors), new social media (twitter, facebook, etc)
- Use of IPC nurses to deliver IPC & AMS messages

Change topic regularly & tailor message to audience

Use local RCA & incident data as examples

- Photocopies of poor prescribing; description of poor outcome



FIT FIGHTING INFECTION TOGETHER

NHS
County Durham and Darlington NHS Trust
Tees, Esk and Wear Valleys Foundation NHS Trust
NHS County Durham
NHS Darlington

Information for healthcare staff in County Durham and Darlington

Lessons Learned

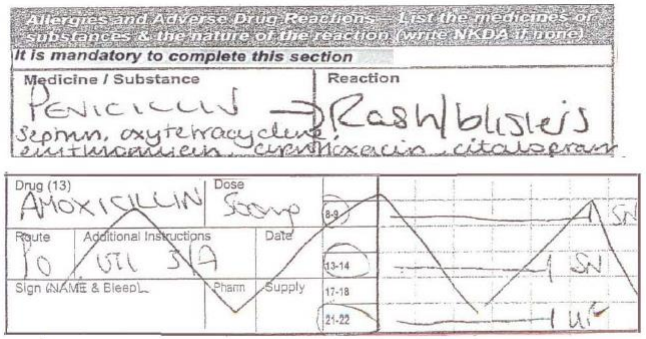
from Root Cause Analysis of Pre and Post 48 hour MRSA Bacteraemia

Root cause analysis on each MRSA bacteraemia is performed to identify the actions we need to take in our commitment to tackle healthcare acquired infections. Following this analysis it is possible to recognise lessons learned and examples are listed overleaf.

We have come a long way in tackling infections but one avoidable infection is one too many and we need to go further. It is important that all healthcare staff take responsibility for adhering to good practice techniques and our infection prevention and control policy and standards.

- Assistance should be sought following two failed attempts at cannulation
- Blood taken from a central line, should be in conjunction with blood taken from peripheral stab
- Always follow Blood culture procedure to avoid contaminated blood culture
- Ensure all patients with an IV line have a VIP chart in use
- Ensure that antibiotic prescribing complies with the antibiotic formulary
- All specimens must be labelled at the bedside
- Chloraprep must be used for decontaminating skin for insertion of venous catheters or sampling of blood
- VIP score must be recorded each shift - this includes night shift

1. Patient administer 3 doses of amoxicillin with a recorded penicillin allergy



Allergies and Adverse Drug Reactions – List the medicines or substances & the nature of the reaction (write NKDA if none)
It is mandatory to complete this section

Medicine / Substance	Reaction
PENICILLIN	Rash/blisters
Septrin, oxytetracycline, ciprofloxacin, citalopram	

Drug (13): AMOXICILLIN — Dose: 500mg — Route: PO — Additional Instructions: UTI 3/7 — Date — Sign (NAME & Bleep) — Pharm — Supply

8-9 13-14 17-18 21-22

Learning

- Allergy status MUST be checked before prescribing antibiotic
- Allergy status MUST be checked before administering antibiotic

Summary: To improve antibiotic prescribing in hospitals

- Design systems to force better prescribing
- Consensus based, easy to access guidelines
- Quality improvement, not annual audit
- Local antibiotic champions
- Merge IPC & AMS teams
- Monitor & benchmark antibiotic usage
- Regular but varied communication
- Local education & training at ward level

UKCPA
CLINICAL PHARMACY ASSOCIATION

Pharmacy INFECTION Network

ROYAL PHARMACEUTICAL SOCIETY

NHS England

Promoting appropriate antimicrobial prescribing in secondary care



Philip Howard

Consultant Pharmacist

Twitter: AntibioticLeeds

p.howard@leeds.ac.uk

UNIVERSITY OF LEEDS

The Leeds Teaching Hospitals NHS Trust

New antibiotics coming in 2015-7

NHS England

- Oritavancin IV weekly (Q2 '15) - cSSTI
- Telavancin IV daily G+ve HAP (Q3 '14) = teicoplanin / vancomycin
- Dalbavancin IV weekly – cSSTI (Q1 '15), CAP 2017
- Tedizolid –po/IV daily - Q2'15: like linezolid but without the interactions or haematological side-effects
- Ceftolozane-tazobactam IV – Q4'15: cUTI, cIAI (abdo), (VAP later) – covers ESBL E.coli and MDR PsA, but not Kleb pneum
- Ceftibiprole – licensed but launch 2015 for CAP/HAP (= linezolid + ceftazidime)
- Ceftazidime – avibactam IV Q1/2'16 – where no other options for cUTI/cIAI – broad activity vs ESBL E.coli & Kleb, PsA and carbapenemases. Some Acin baum activity.
- Eravacycline IV/po 2017 – cIAI by ESBLs = ertapenem

http://antibiotics-theperfectstorm.blogspot.co.uk/2014/12/antibiotics-in-2014-banner-year.html
http://www.ukmi.nhs.uk/applications/ndo/dbSearch.asp