

Using a quality improvement approach to optimise antimicrobial prescribing

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EAHP ACADEMY SEMINAR

Antibiotic Stewardship for Beginners

UKCPA
CLINICAL PHARMACY ASSOCIATION



Disclosure of Relevant Financial Relationships

▶ **NO DECLARATIONS**

Questions about quality improvement in antimicrobial stewardship

- ❖ Quality improvement interventions require collection of large amounts of data



- ❖ A point prevalence survey is a type of audit



- ❖ Quality indicators allow trends to be measured



Overview of session

- ▶ Antibiotic use in hospitals - what are the problems
- ▶ Quality improvement methodology
- ▶ Audit and feedback
- ▶ Quality indicators
- ▶ Sharing results of interventions

Problems with antibiotic use in hospitals

- ▶ **Unnecessary use**

e.g. viral infections, self-limiting infections, uncertain diagnosis

- ▶ **Sub-optimal use**

Remember the 5 rights: RIGHT CHOICE

RIGHT DOSE

RIGHT FREQUENCY

RIGHT ROUTE

RIGHT DURATION

Measurement for improvement

- Measurement has traditionally been used in research but more recently has been used in benchmarking and scrutiny within healthcare.
- Quality improvement methodology within healthcare has expanded rapidly over the past ten years but effective data capture is a key factor in success.
- Electronic systems can capture data to provide quantitative and qualitative information for monitoring longitudinal trends and changes in practice. However manual collection of data through clinical audit may be required in many hospitals.
- When collecting data we need to think carefully about our specific reasons for collecting it, as this will inform the type and quantity of data needed.

Types of data collection

	IMPROVEMENT	ACCOUNTABILITY	RESEARCH
Purpose	<p>Understanding of Process</p> <p>Evaluation of change</p> <p>To bring new knowledge into daily practice</p>	<p>Comparison</p> <p>Reassurance</p>	<p>To discover new knowledge</p>
Data	<p>Gather just enough data to learn and complete another cycle</p>	<p>Large amounts of data on ongoing basis</p>	<p>Gather as much data as possible 'just in case'</p>
Duration	<p>Short period of time - weeks, months</p> <p>Small 'tests of change' accelerates the rate of improvement</p>	<p>Medium - long duration</p> <p>Longitudinal trends and historic data</p>	<p>Can take long periods of time to obtain results</p>
Analysis	<p>Run charts or statistical process control charts</p>	<p>League tables/benchmarking achievement of target</p>	<p>Traditional statistical tests</p>

Choice of approach for antimicrobial stewardship

- ▶ Within antimicrobial stewardship programmes qualitative data is often used to influence antimicrobial prescribing behaviour.
- ▶ If an urgent change in antimicrobial prescribing practice is required a quality improvement approach is best as this can have an impact on a small scale in a matter of days or weeks.
- ▶ For larger scale changes an accountability approach may be better, with audits over several wards and feedback to staff. This will take time to establish a baseline, set targets and regular re-audit to determine if practice is changing.
- ▶ A research approach is useful for generating robust data about the impact of changes in prescribing on both process and patient outcomes.

Quality Improvement methodology

- ▶ There are several quality improvement methodologies used in healthcare, e.g. the Model for Improvement, LEAN, Six Sigma, but all use similar components.
- ▶ The **Model for Improvement** provides a simple, yet powerful tool for accelerating improvement based on three fundamental questions:
 - What are we trying to achieve? A clear aim - what, how much, by when?
 - How will we know that change is an improvement? Measuring processes and outcomes.
 - What ideas for changes can we identify that will result in an improvement? Test some ideas to see which changes may work.
- ▶ If you would like to learn more about quality improvement methodology in healthcare the following resources provide further information:

[Institute for Healthcare Improvement](#)

[The Health Foundation](#)

Improvement cycles - PLAN DO STUDY ACT



Start with one patient and test some changes, once something works move on to try on 3 patients then 5 patients then whole ward

“Won’t measurement and QI mean more work when we are already busy”

“Every system is perfectly designed to get the results it gets.”

“Everyone in healthcare has two jobs when they come to work; to do their work and to improve it. This is the essence of Quality Improvement (QI).”

- Paul B Batalden

Audit of antimicrobial prescribing

Audit is the key method of collecting qualitative data within antimicrobial stewardship programmes.

Audit may be carried out in a variety of ways depending on resources available and objectives for collecting it.

Continuous audit - data on all patients prescribed antibiotics. Rarely practical without electronic data systems

Point prevalence surveys - snapshot audits across the whole hospital or selected wards at regular time intervals to track trends.

Prescribing indicators - collection of selected data to provide information about specific aspects of prescribing practice.

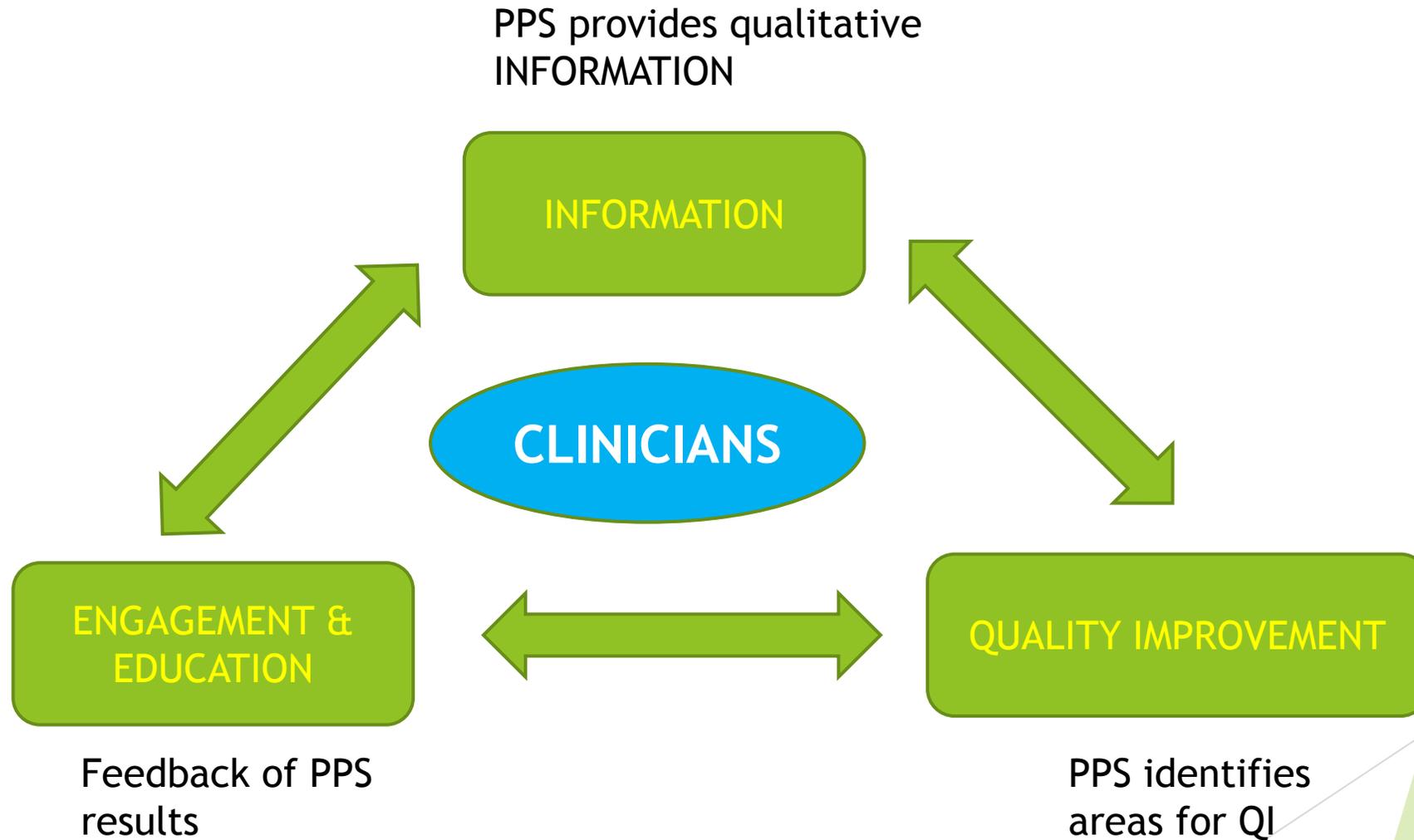
Point Prevalence Survey (PPS) - definition

- Common definition for **point prevalence** is the amount of people with a particular characteristic at a certain point in time.
- Determined by taking the **total number of people with the characteristic** divided by the **total number of people in the population** of interest.
- In healthcare often used to determine prevalence of infection, particularly healthcare associated infection as a performance metric.
- A Point Prevalence Survey (PPS) of antibiotic use will measure the number of people taking antibiotics at a given point in time within a hospital/ward.
- For example - 5 patients in a 20 bed surgical ward receiving antibiotics on the day of the survey gives a prevalence of antibiotic use of 25%

Aim of PPS of antibiotic use

- Identify and monitor rates of antibiotic prescribing in hospitalised patients
- Identify differences between prescribing rates between hospital departments, hospitals, regions and countries
- Determine variation in antibiotics, dose and indication across different locations
- Help to identify targets for quality improvement in antibiotic prescribing
- Identify interventions to promote better stewardship of antibiotics to assist the fight against antimicrobial resistance
- Assess the effectiveness of interventions through repeated surveys

Cycle of AMS activities



Clinicians = doctors, nurses and pharmacists

Information from PPS of antibiotic use

- Patterns of use of broad and narrow spectrum antibiotics
- Indications for antibiotic treatment of community acquired or hospital acquired infection or medical or surgical prophylaxis
- Which antibiotics are being used for particular infections?
- Are the antibiotics prescribed in line with local prescribing guidelines?
- What is the duration of antibiotics for surgical prophylaxis?
- Has a clear duration of treatment or stop date been recorded?
- Has the treatment been changed in light of microbiology results?

Getting started with PPS data collection

Simple data collection form

Patient ID	
Name of drug	
Route	
Unit dose	
Dosage frequency	
Indication	
Complies with (local) guidance	

Using a simple paper form you can easily collect data from patients on one ward on one day, collate and aggregate the data then analyse

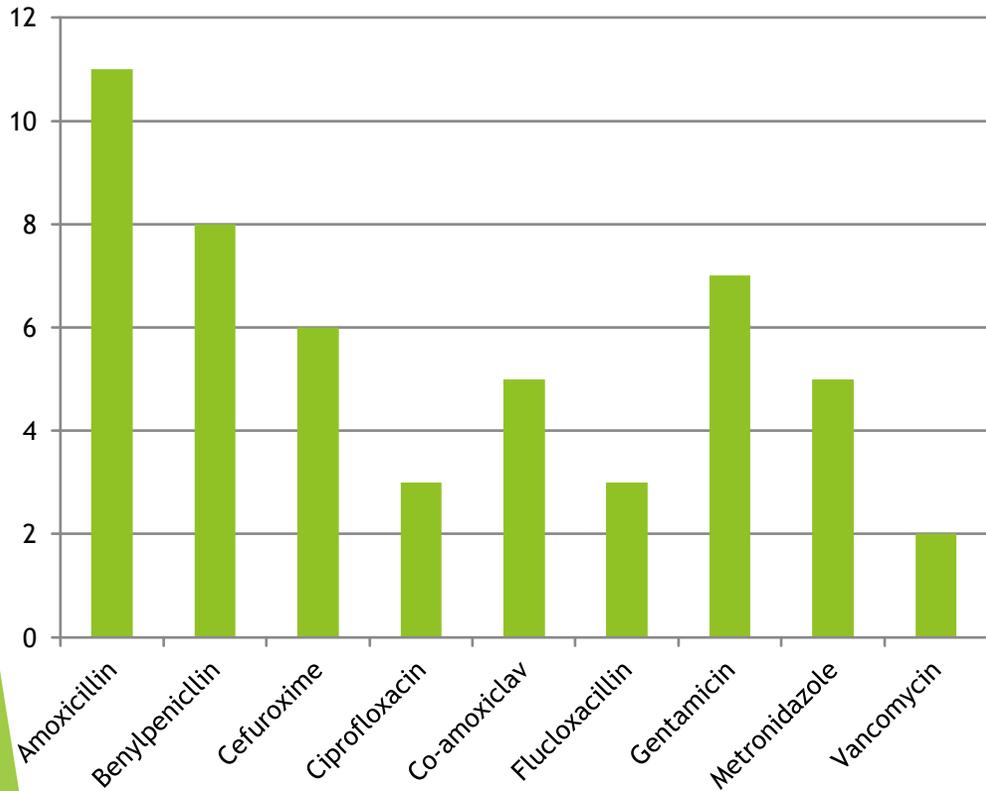
Scale up to small hospital and use Microsoft Excel for data collation and analysis

Preparing for a PPS - what is required?

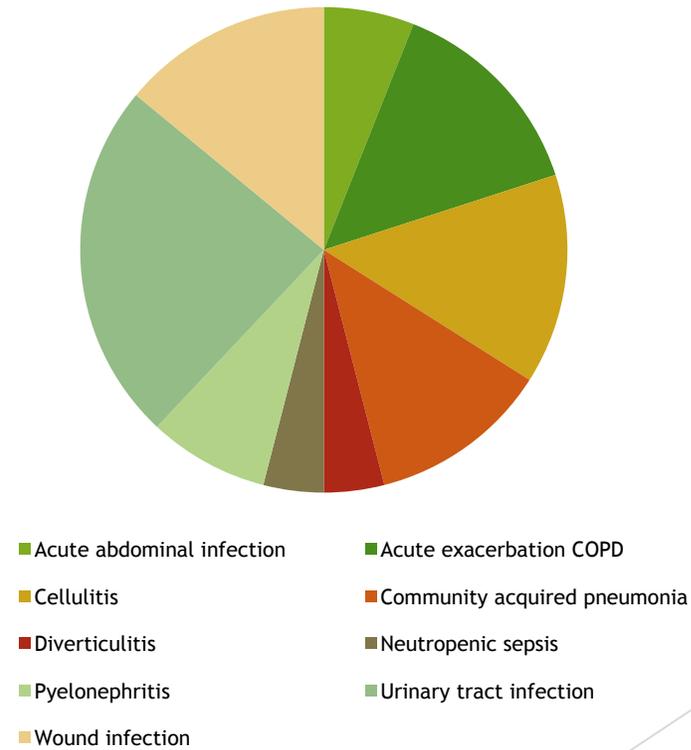
- ▶ **Data collectors:** to visit wards in the hospital within the survey period. A large team can visit all wards over a relatively short space of time while with a smaller team it will take longer.
- ▶ **Protocol and data collection forms:** to specify which ward level data and patient level data to collect. Important to classify indication for antibiotic and anatomical site of presumed infection - usually via a list of codes.
- ▶ **Staff training:** focused on completion of the data collection in a consistent manner. Important to ensure data collectors understand all definitions and codes.
- ▶ **Communication:** engaging ward staff is important to explain why the survey is being conducted.
- ▶ **Information governance and data security:** ensure the hospital's clinical governance committee are aware the survey is being conducted and are reassured about the safe handling of information.

Simple PPS Data presentation

Total number of prescriptions by antibiotic
(n=50)

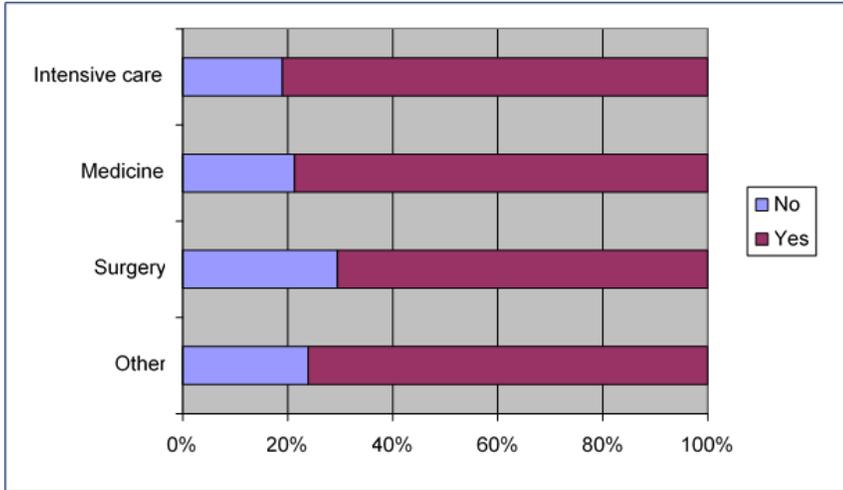


Total number of patients with each infection type
(n= 50)

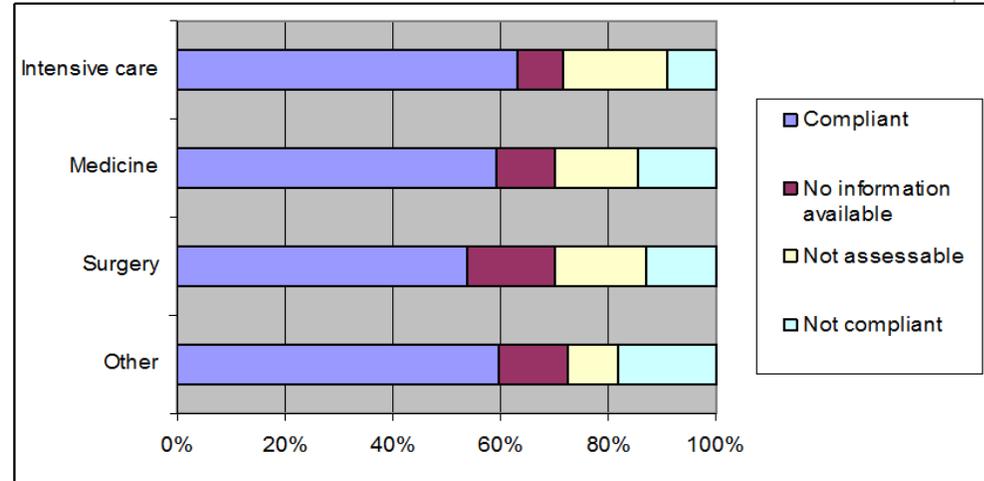


Example results from hospital wide PPS

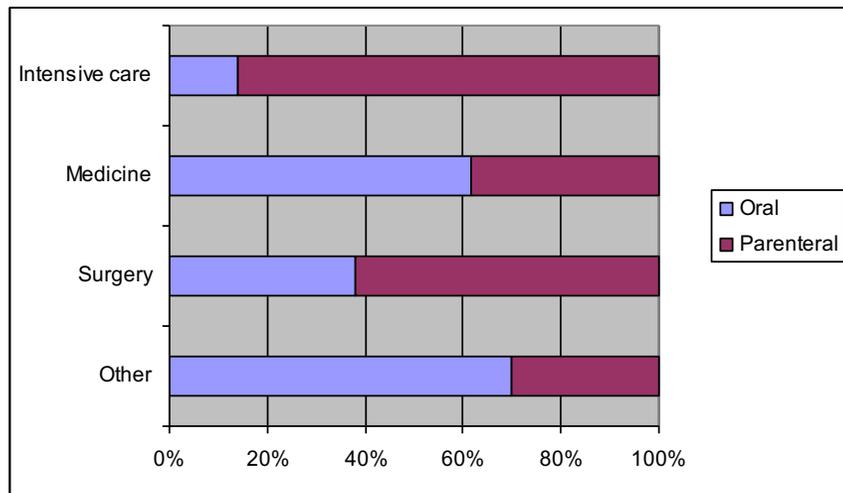
Recording of indication in notes



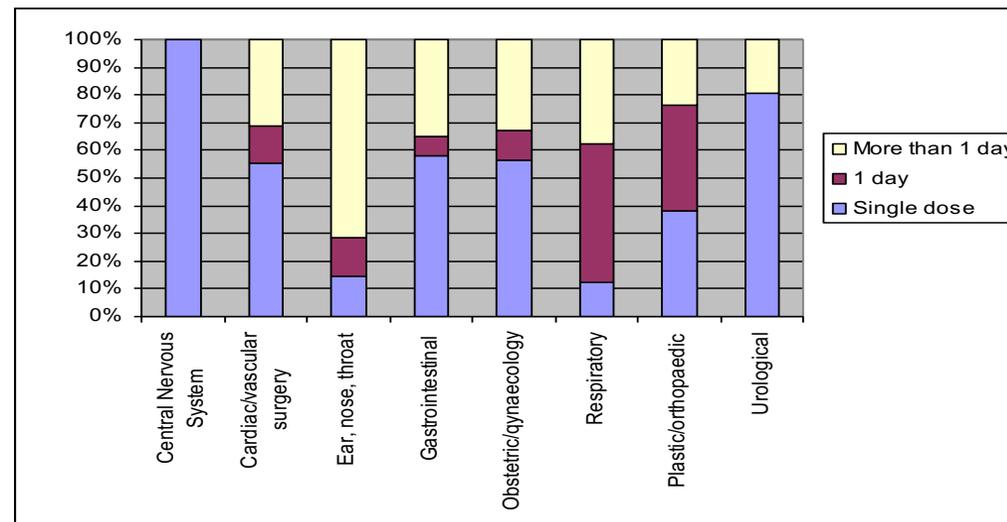
Compliance with local guidelines



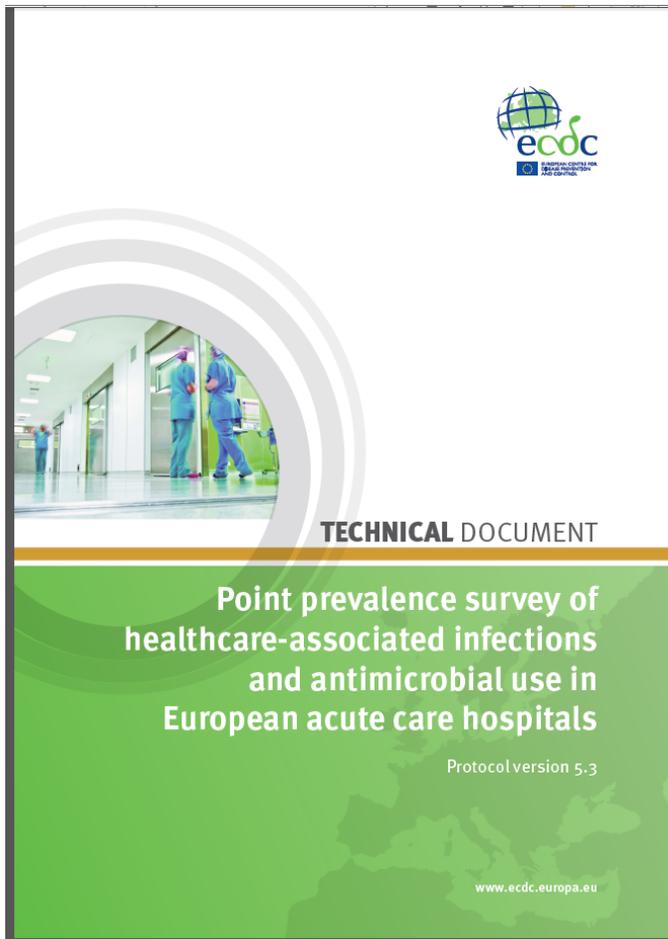
Route of administration



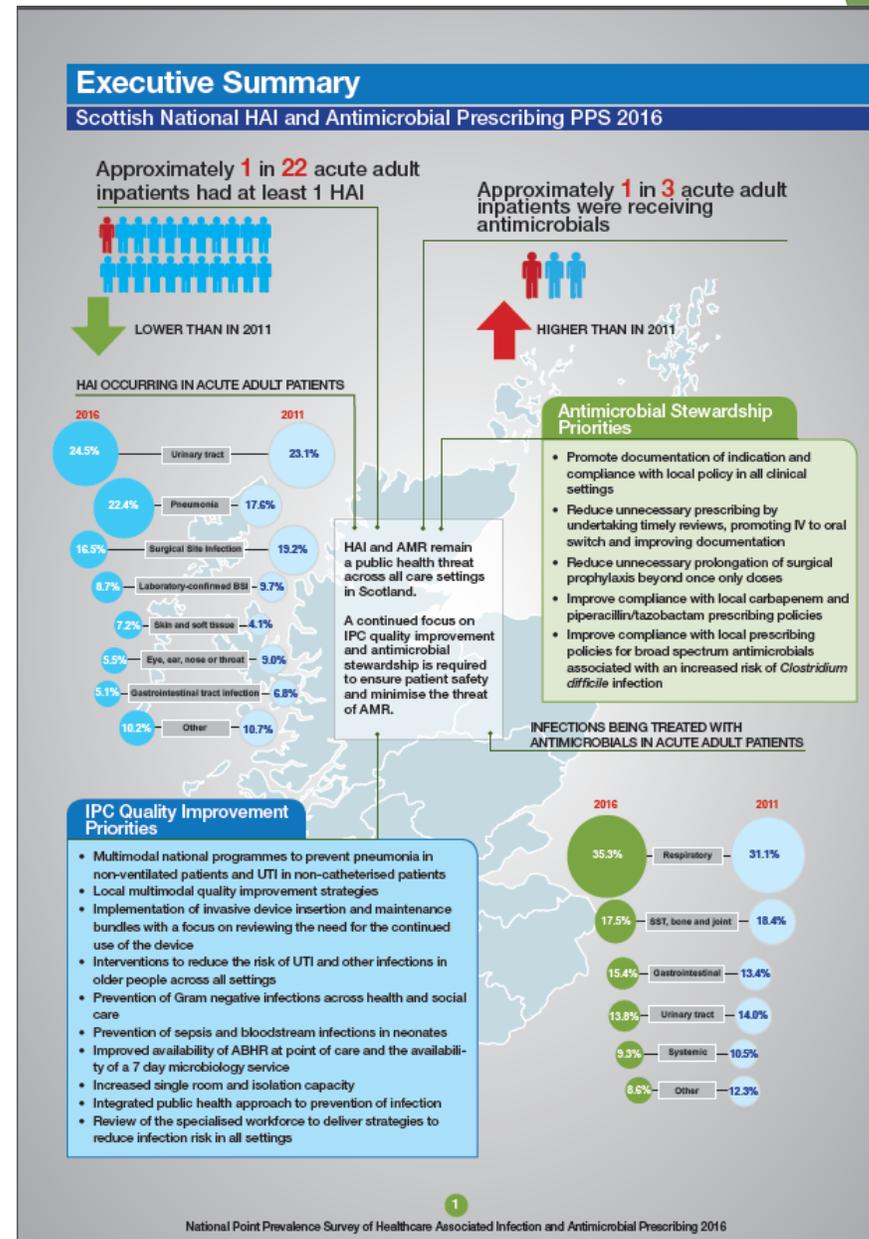
Duration of surgical prophylaxis by specialty



Larger scale PPS



<https://ecdc.europa.eu/sites/portal/files/media/en/publications/Publications/PPS-HAI-antimicrobial-use-EU-acute-care-hospitals-V5-3.pdf>



<http://www.hps.scot.nhs.uk/pubs/detail.aspx?id=3236>

Global PPS

- ▶ A Global Point Prevalence Survey of Antimicrobial Consumption and Resistance was developed in 2015 and will conduct the next PPS in 2017. The core data set has been based on ECDC European PPS.
- ▶ More information on the Global PPS is available at <http://www.global-pps.com/>



Want to know more about PPS?

The screenshot shows a course page on the Future Learn platform. At the top left is the Future Learn logo. A navigation bar contains links for 'Categories', 'Courses', 'Programs', and 'Degrees'. The course title is 'Challenges in Antibiotic Resistance: Point Prevalence Surveys', categorized as an 'ONLINE COURSE'. A description states: 'Learn how to use Point Prevalence Surveys (PPS) to measure antibiotic consumption and fight antimicrobial resistance.' The BSAC logo (The British Society for Antimicrobial Chemotherapy) is displayed. Two buttons are present: 'Join free' and 'Upgrade - £49', with a link 'What's the difference?' below them. A large molecular structure image is featured below the text. At the bottom, a navigation bar includes links for 'Overview', 'Topics', 'Start dates', 'Requirements', and 'Educators'.

Next free on-line 2-week course starts on 16th October

Beyond PPS - developing quality indicators

Malcolm et al. *Antimicrobial Resistance and Infection Control* 2013, 2:3
<http://www.aricjournal.com/content/2/1/3>



RESEARCH

Open Access

From intermittent antibiotic point prevalence surveys to quality improvement: experience in Scottish hospitals

William Malcolm^{1*}, Dilip Nathwani², Peter Davey³, Tracey Cromwell⁴, Andrea Patton⁵, Jacqueline Reilly¹, Shona Cairns¹ and Marion Bennie^{4,6}

Abstract

Background: In 2008, the Scottish Antimicrobial Prescribing Group (SAPG) was established to coordinate a national antimicrobial stewardship programme. In 2009 SAPG led participation in a European point prevalence survey (PPS) of hospital antibiotic use. We describe how SAPG used this baseline PPS as the foundation for implementation of measures for improvement in antibiotic prescribing.

Methods: In 2009 data for the baseline PPS were collected in accordance with the European Surveillance of Antimicrobial Consumption [ESAC] protocol. This informed the development of two quality prescribing indicators: compliance with antibiotic policy in acute admission units and duration of surgical prophylaxis. From December 2009 clinicians collected these data on a monthly basis. The prescribing indicators were reviewed and further modified in March 2011. Data for the follow up PPS in September 2011 were collected as part of a national PPS of healthcare associated infection and antimicrobial use developed using ECDC protocols.

Results: In the baseline PPS data were collected in 22 (56%) acute hospitals. The frequency of recording the reason for treatment in medical notes was similar in Scotland (75.9%) and Europe (75.7%). Compliance with policy (81.0%) was also similar to Europe (82.5%) but duration of surgical prophylaxis <24hr (68.6%), was higher than in Europe (48.1%, OR: 0.41, p<0.001). Following the development and implementation of the prescribing indicators monthly measurement and data feedback in admission units illustrated improvement in indication documented of ≥90% and compliance with antibiotic prescribing policy increasing from 76% to 90%. The initial prescribing indicator in surgical prophylaxis was less successful in providing consistent national data as there was local discretion on which procedures to include. Following a review and a focus on colorectal surgery the mean proportion receiving single dose prophylaxis exceeded the target of 95% and the mean proportion compliant with policy was 83%. In the follow up PPS of 2011 indication documented (86.8%) and policy compliant (82.8%) were higher than in baseline PPS.

Conclusions: The baseline PPS identified priorities for quality improvement. SAPG has demonstrated that implementation of regularly reviewed national prescribing indicators, acceptable to clinicians, implemented through regular systematic measurement can drive improvement in quality of antibiotic use in key clinical areas. However, our data also show that the ESAC PPS method may underestimate the proportion of surgical prophylaxis with duration <24hr.

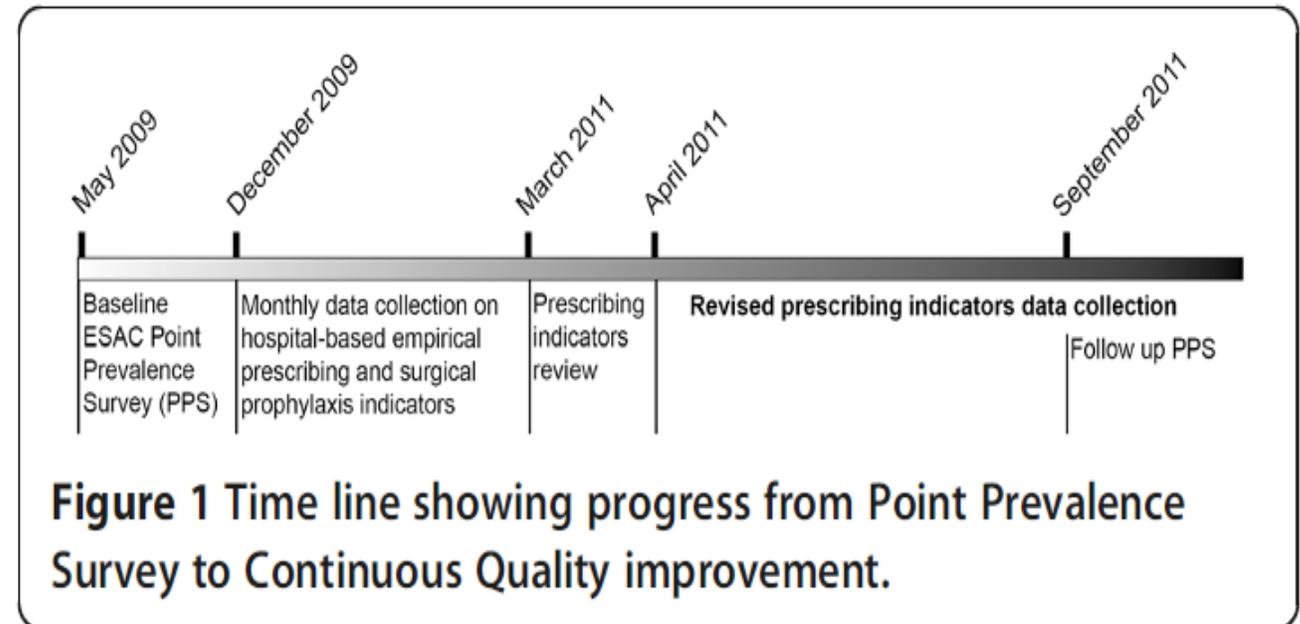


Figure 1 Time line showing progress from Point Prevalence Survey to Continuous Quality improvement.

Quality Indicators for prescribing

▶ DEFINITION

explicitly defined measurable items giving a possible indication on the level of quality.

▶ Quality indicators allow trends to be measured

- over time
- between locations
- before/after interventions

▶ There are three main types of indicators - structural, process and outcome.

Types of Quality Indicators used in stewardship programmes

- ▶ **Structural indicators** measure whether governance structures are in place for stewardship e.g. does a hospital have an Antimicrobial Team which meets regularly, reports to senior management and has an action plan?
- ▶ **Process indicators** measure systems in place for stewardship e.g. surveillance programme for antibiotic use, programme of audits, education for healthcare staff.
- ▶ **Outcome measures** are used to measure the impact of a stewardship programme and should include both intended and unintended outcomes such as reduced use of restricted antibiotics (intended) and increase in resistance to recommended antibiotics (unintended).
- ▶ **Patient outcome measures** are the most useful but most difficult to collect e.g. mortality rate, cure rate

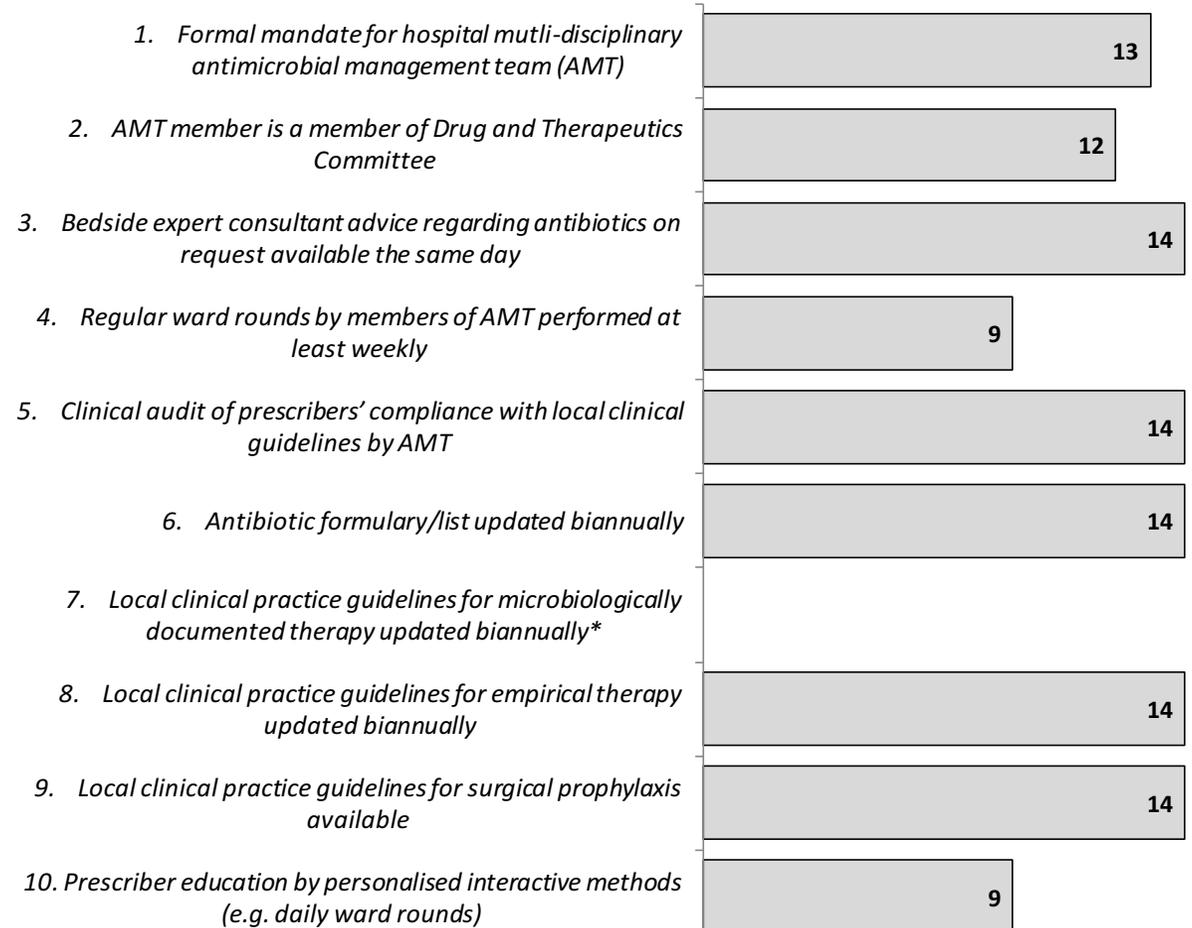
Structure indicators for stewardship

Development and validation of potential structure indicators for evaluating antimicrobial stewardship programmes in European hospitals

F. M. Buyle · S. Metz-Gercek · R. Mechtler · W. V. Kern ·
H. Robays · D. Vogelaers · M. J. Struelens · on behalf of
members of the Antibiotic Strategy International (ABS)
Quality Indicators Team

Eur J Clin Microbiol Infect Dis. 2013; 32: 1161-70

Performance of 14 Scottish AMTs against 10 European Validated Indicators



* Not applicable to Scottish Practice

Prescribing Quality Indicators

Prescribing quality indicators in hospital usually focus on the process of prescribing an antibiotic and how this is documented.



What could be measured to determine quality of prescribing and identify which part of process needs improved?

Documentation is key - standards for QIs

DIAGNOSIS
OF
INFECTION

DIAGNOSIS

signs and symptoms,
differential
diagnosis, results
and management
plan written in
medical notes

ANTIBIOTIC
PRESCRIBED

PRESCRIPTION

choice, dose,
frequency, route
and duration
written on medicine
chart or within e-
prescribing system

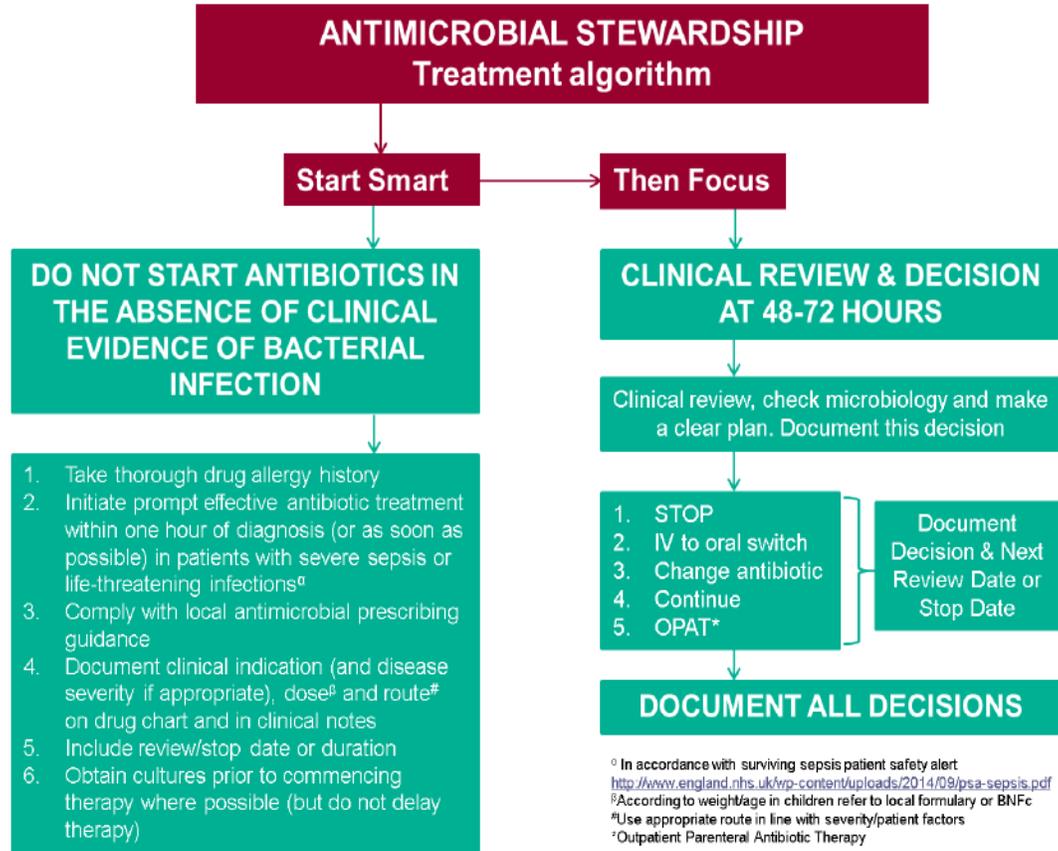
PATIENT
RECEIVES
ANTIBIOTIC

ADMINISTRATION

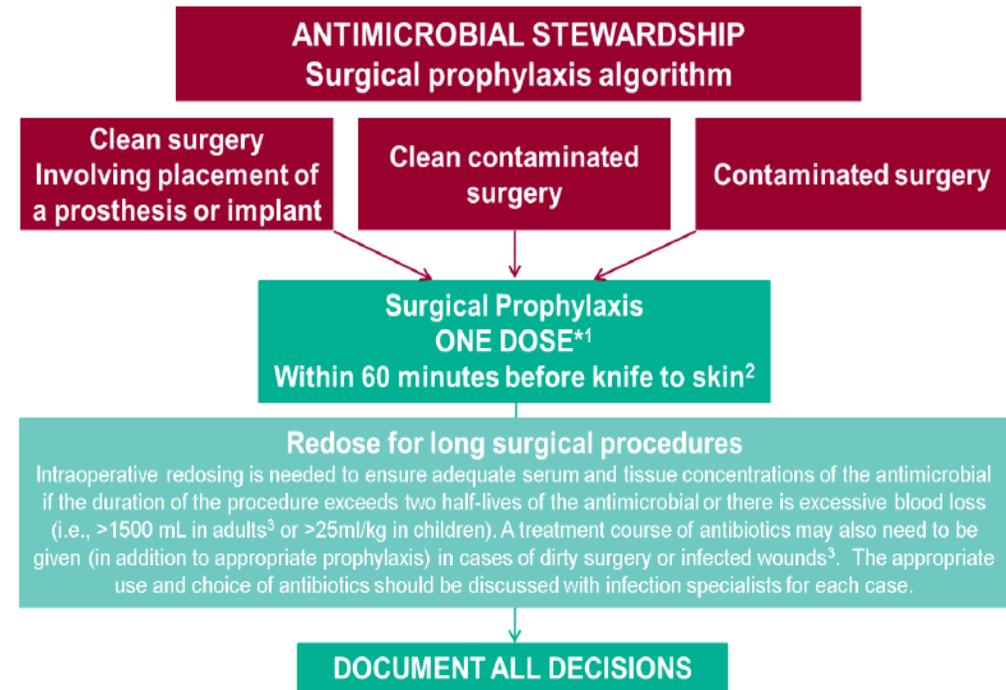
confirmation of each
dose being
administered to the
patient written on
medicine chart or
within e-prescribing
system

Start Smart Then Focus to inform QIs

Antimicrobial Stewardship (AMS) – Treatment algorithm



Antimicrobial Stewardship (AMS) – Surgical prophylaxis algorithm



References:

1. NICE clinical guideline 74: Surgical site infection – Prevention and treatment of surgical site infection <http://www.nice.org.uk/Guidance/CG74>
2. World alliance for Patient Safety. WHO surgical safety checklist June 2008 http://www.who.int/patientafety/safesurgery/tools_resources/SSSL_Checklist_finalJun08.pdf?ua=1
3. Bratzler DW, Dellinger EP, Olsen KM et al. (2013). Clinical practice guidelines for antimicrobial prophylaxis in surgery. Am J Health Syst Pharm 2013; 70(3): 195-283

Audit tools to create prescribing QIs

- ▶ University Hospital Southampton NHS Foundation Trust
HAPPI audits (Hospital Antibiotic Prudent Prescribing Indicators)

- ▶ **Audit standards**
 1. Indication / provisional diagnosis documented on start date
 2. Antibiotic choice according to guideline (or justified off-guideline choice)
 3. Appropriate dose prescribed
 4. Reviewed at 48-72 hours with documented treatment plan
 5. Total course length ≤ 7 days (or justified)

- ▶ *Courtesy of K Hand & H Wickens, Consultant Pharmacists - Anti-infectives*

Further examples from the UK available via

Start Smart then Focus toolkit

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/417041/Revised_SSTF_Tools_Annex_FINAL.pdf

Prescribing indicators - using a quality improvement approach

AIM

MEASURES

CHANGES

Start small - focus on one ward with high prevalence of antibiotic use

Frequent data collection and feedback - focus on a few measures

Test changes and repeat - discuss improvements with clinical team

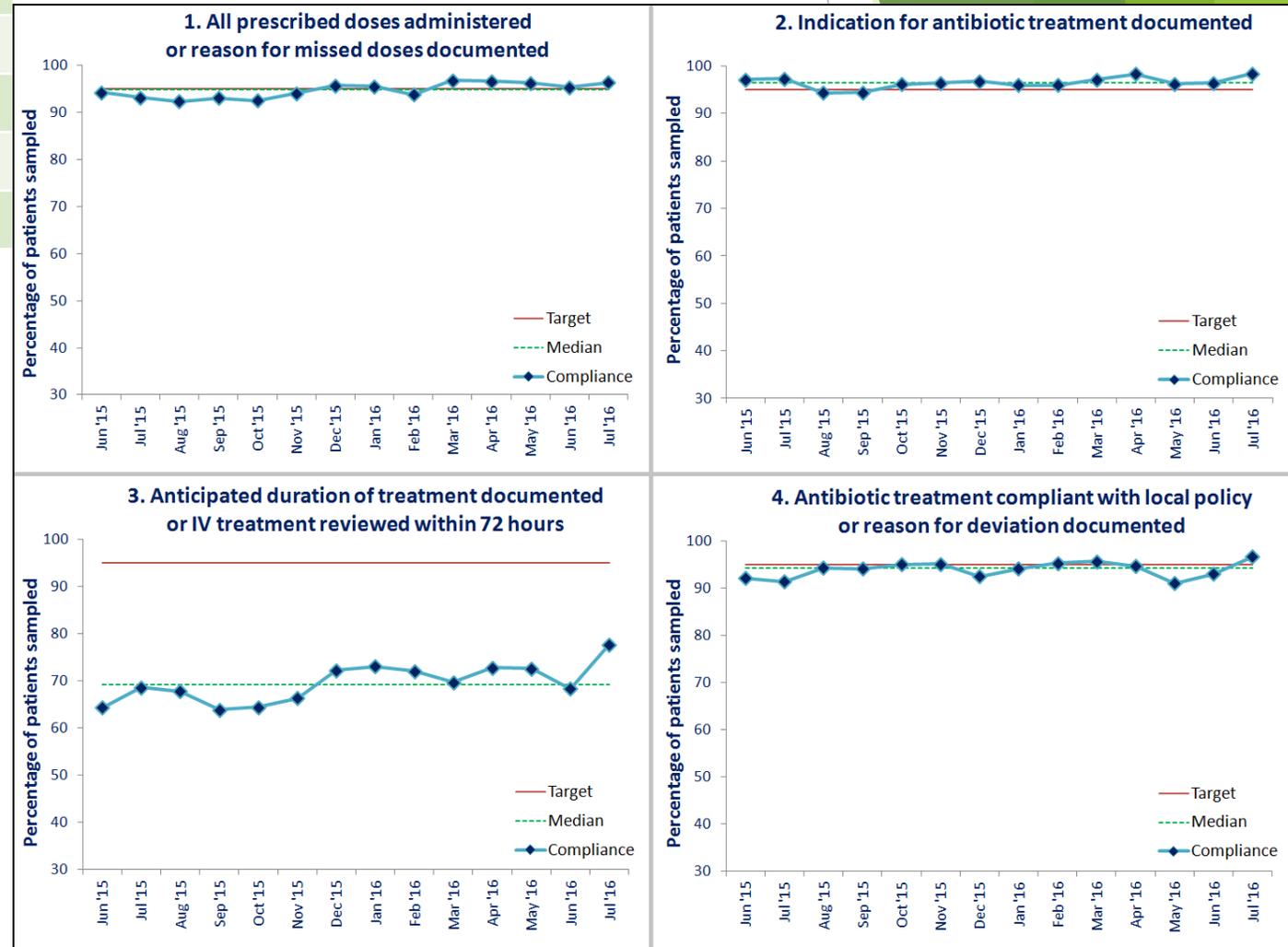
Example data collection

Empirical Prescribing indicator	Patient 1	Patient 2	Patient 3	Patient 4	Patient 5
Indication for Antibiotic Treatment Recorded in Notes?	Y / N	Y / N	Y / N	Y / N	Y / N
Antibiotic(s) Compliant with Local Prescribing Policy?	Y / N	Y / N	Y / N	Y / N	Y / N
All doses administered as per medicine chart?	Y / N	Y / N	Y / N	Y / N	Y / N

Prescribing quality indicators - Scotland

Measure	Medical				Surgical			
	Median (%)	Min (%)	Max (%)	Boards compliant	Median (%)	Min (%)	Max (%)	Boards compliant
1. Doses administered	95	91	100	8/14	94	84	100	6/15
2. Indication documented	96	84	100	10/14	93	86	100	6/15
3. Duration documented	69	45	95	1/14	54	29	97	1/15
4. Compliant with policy	94	90	100	8/14	90	82	100	3/15

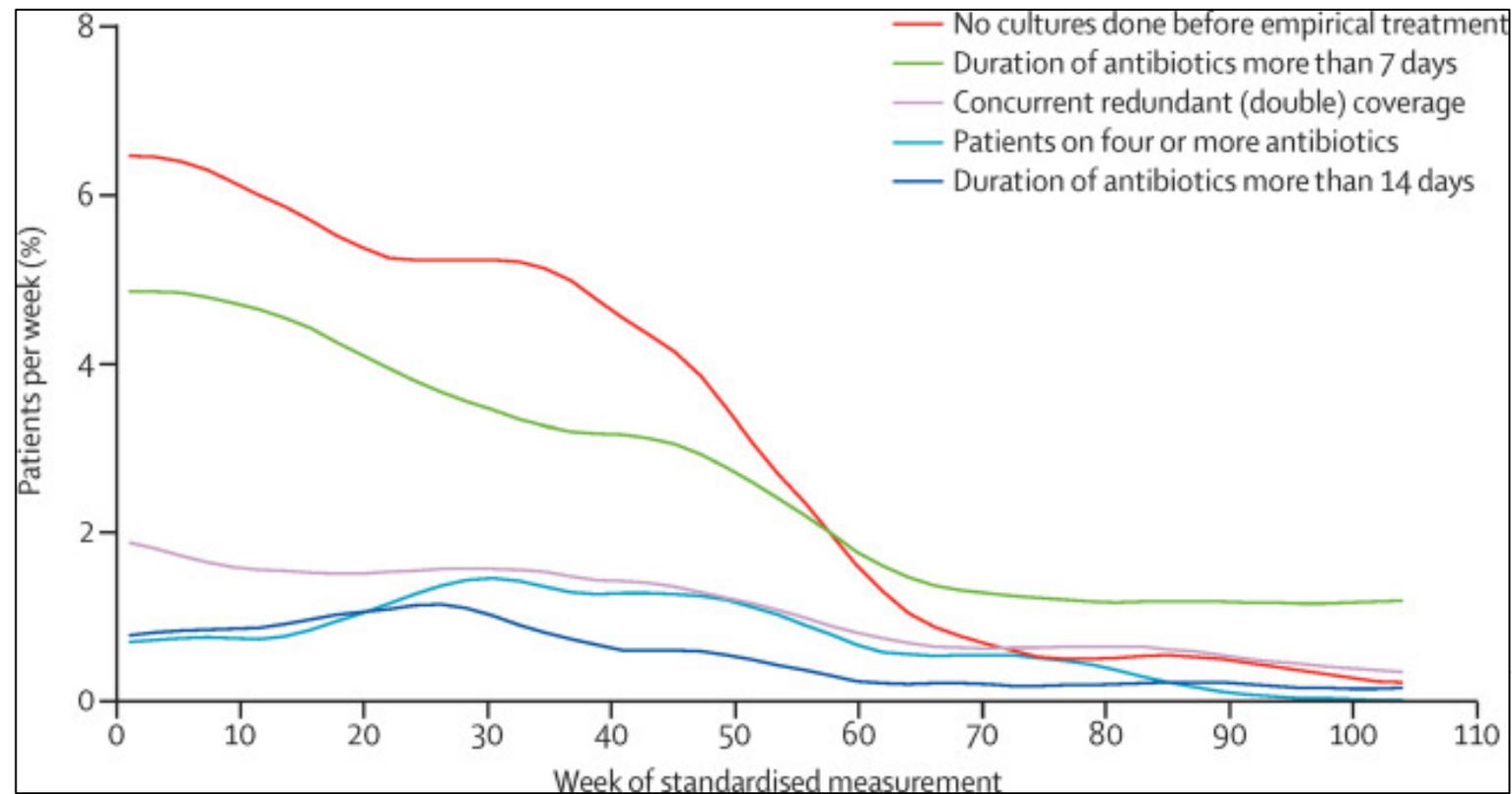
Median percentage compliance with measures at a national level and number of health boards reaching target 95% compliance.



Antimicrobial stewardship across 47 South African hospitals: an implementation study

[http://thelancet.com/journals/laninf/article/PIIS1473-3099\(16\)30012-3/fulltext](http://thelancet.com/journals/laninf/article/PIIS1473-3099(16)30012-3/fulltext)

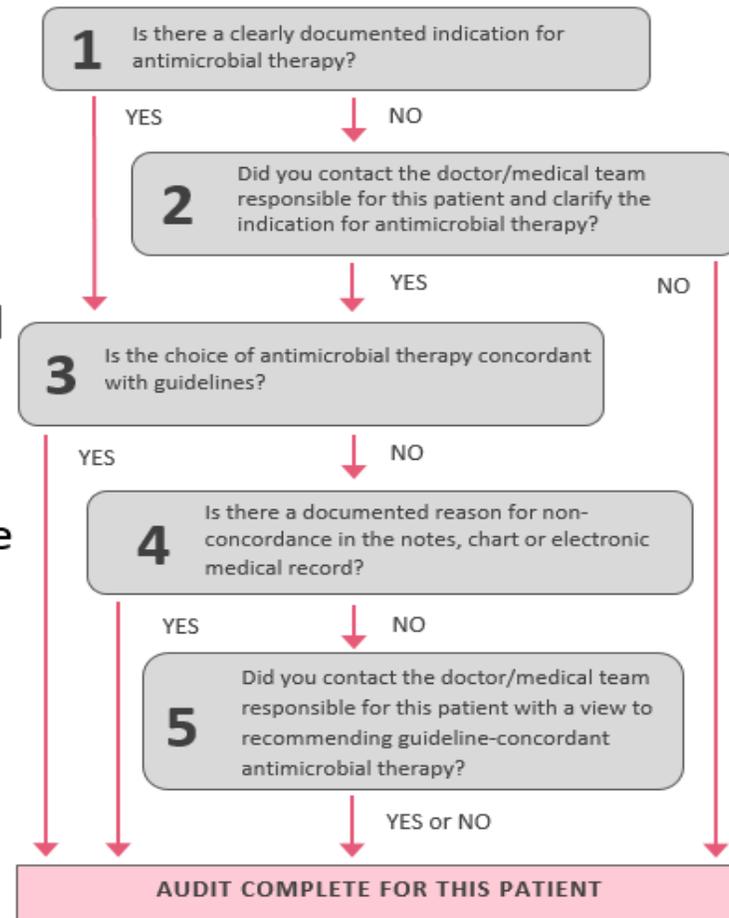
Health-care facilities with limited infectious diseases expertise can achieve substantial returns through pharmacist-led antimicrobial stewardship programmes and by focusing on basic interventions.



Australian hospital audit system

What is the 5x5 Antimicrobial Audit?

- A continuous audit activity that collects information about empirical antimicrobial prescribing
- Developed by the Clinical Excellence Commission and based on the work of the Scottish Antimicrobial Prescribing Group
- Auditors answer up to 5 yes/no questions for 5 patients per week, with the audit process combining both data collection and prompted intervention



Using technology to make QI easy

Antimicrobial Companion App.

Select Hospital ▼

Select Ward ▼

April 2017 ▼

	Yes	No
All prescribed doses administered	<input type="radio"/>	<input type="radio"/>
Indication documented in patient's medical notes	<input type="radio"/>	<input type="radio"/>
ORAL THERAPY Duration documented	<input type="radio"/>	<input type="radio"/>
IV THERAPY > 72 hours Duration or Review date documented	<input type="radio"/>	<input type="radio"/>
Treatment compliant with policy	<input type="radio"/>	<input type="radio"/>

Submit Audit Data ▶

After login, the audit tool allows submission of audit data.

After submission of data, the audit tool displays the number of submissions for that period within the selected ward.

Reports created monthly by app administrator in each hospital

39

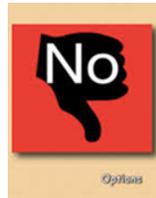
Audit submissions for Western Isles in March 2017 so far.

	Yes	No
All prescribed doses administered	<input checked="" type="radio"/>	<input type="radio"/>
Indication documented in patient's medical notes	<input checked="" type="radio"/>	<input type="radio"/>
ORAL THERAPY Duration documented	<input type="radio"/>	<input type="radio"/>
IV THERAPY > 72 hours Duration or Review date documented	<input type="radio"/>	<input checked="" type="radio"/>
Treatment compliant with policy	<input checked="" type="radio"/>	<input type="radio"/>

Submit Audit Data ▶

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- ❖ Quality improvement interventions require collection of large amounts of data



- ❖ A point prevalence survey is a type of audit



- ❖ Quality indicators allow trends to be measured



THANKS FOR LISTENING

ANY QUESTIONS?

Contact details: jacqueline.sneddon@nhs.net