BRITISH SOCIETY FOR ANTIMICROBIAL CHEMOTHERAPY

MIDDLE EAST ANTIMICROBIAL STEWARDSHIP [AMS] NETWORK
TRAINING THE TRAINER COURSE
AMS SOLUTIONS AND IMPLEMENTATION

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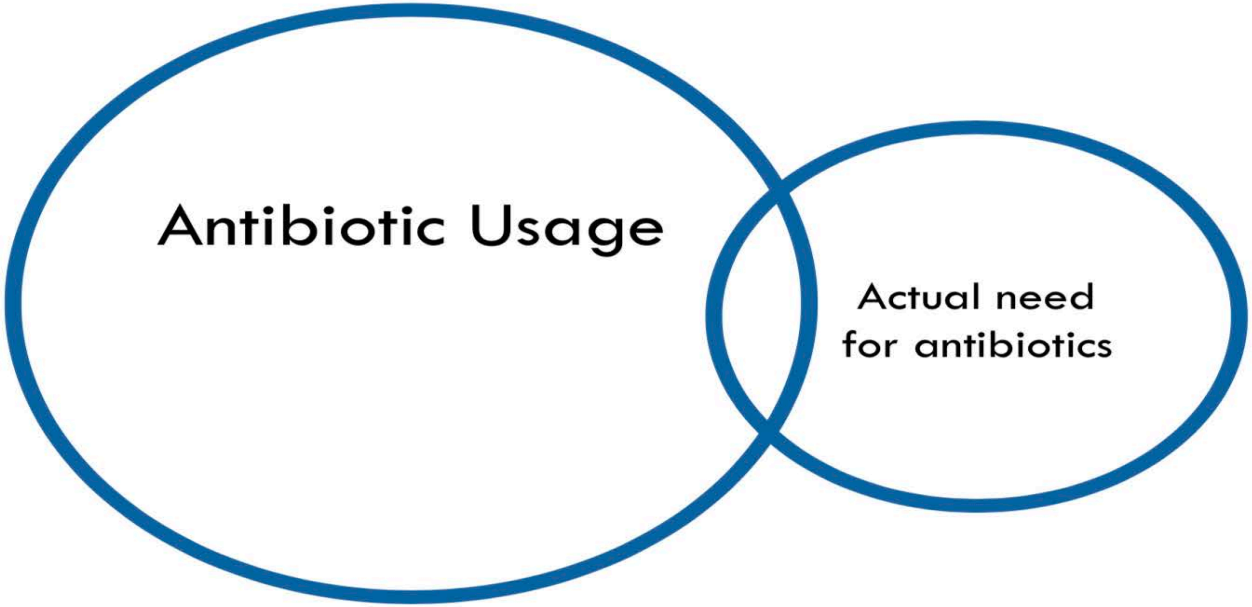
DUBAI

3-4TH FEBRUARY 2020

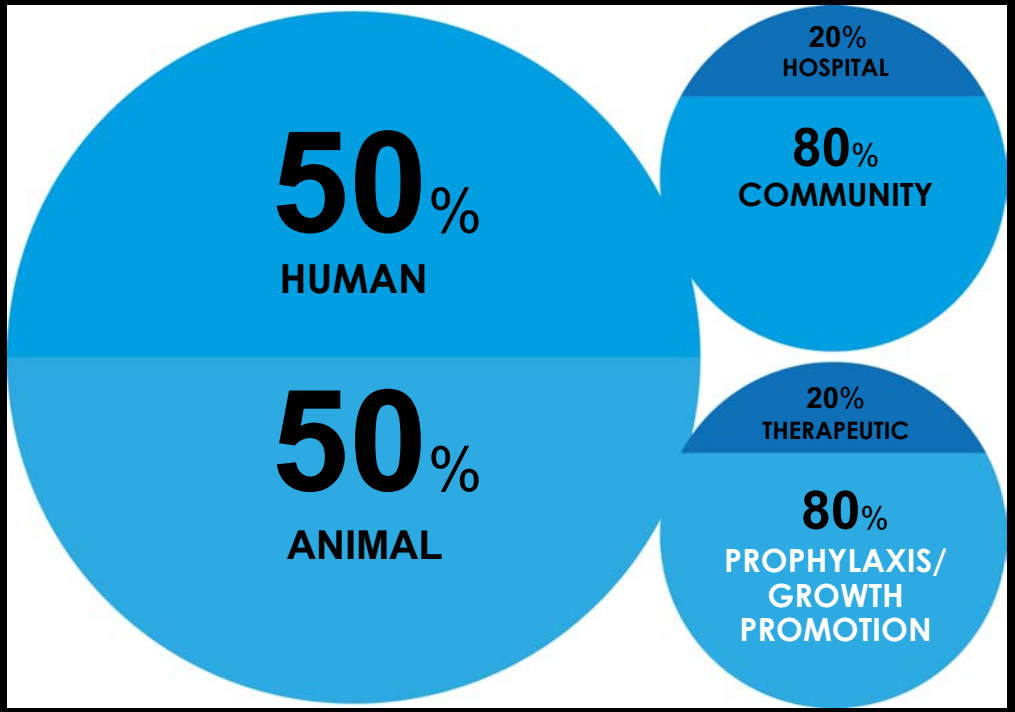
AMR- AMS- A SIMPLE BUT COMPLEX PROBLM

The problem: mismatch between antibiotic usage and need



The solution: 1) reduce antibiotic usage 2) align reduced usage with actual need

A SENSE OF PERSPECTIVE



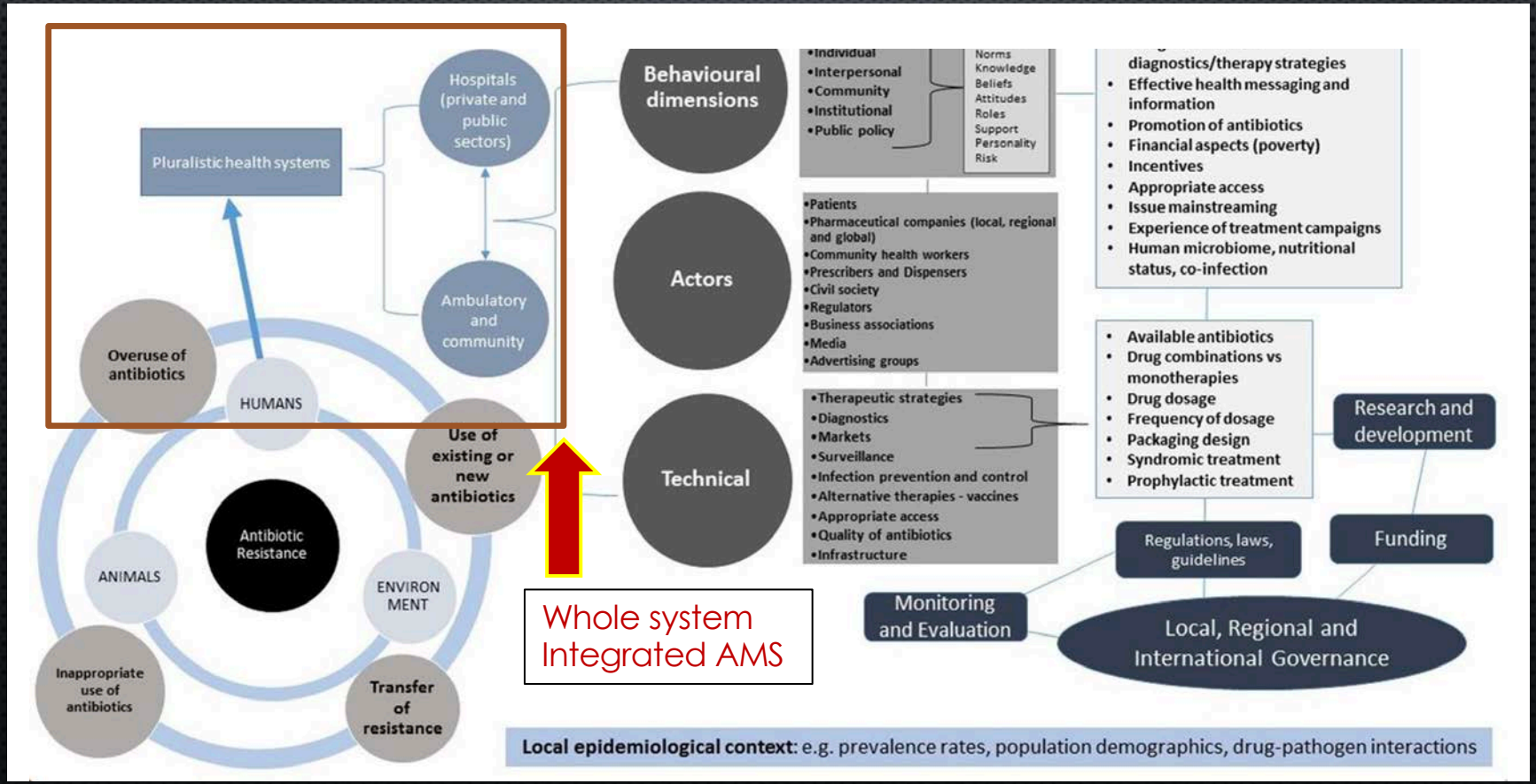
QUESTIONABLE USE

– **20-50%** UNNECESSARY

BUT ~ 80% OF AMS IS IN HOSPITALS & 20% IN THE COMMUNITY

– **40-80%** HIGHLY QUESTIONABLE

Wise *et al.* BMJ 1999; 317: 609-610

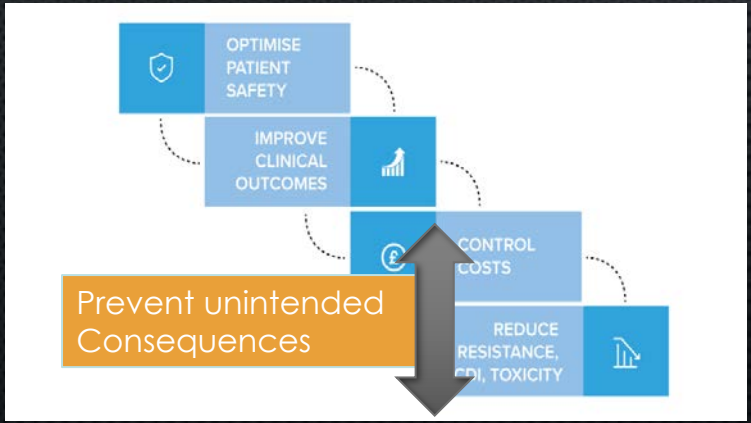


http://dx.doi.org/10.1136/bmjgh-2017-000518

ANTIMICROBIAL STEWARDSHIP: DEFINITION AND GOALS

The term 'antimicrobial stewardship' is defined as 'an organisational or healthcare-system-wide approach to promoting and monitoring judicious use of antimicrobials to preserve their future effectiveness'.

Antimicrobial stewardship has been defined as "the optimal selection, dosage, and duration of antimicrobial treatment that results in the best clinical outcome for the treatment or prevention of infection, with minimal toxicity to the patient and minimal impact on subsequent resistance.



POLICY FORUM

A whole-health–economy approach to antimicrobial stewardship: Analysis of current models and future direction

Monsey McLeod[1,2‡], Raheelah Ahmad[2‡], Nada Atef Shebl[3], Christianne Micallef[4], Fiona Sim[5,6], Alison Holmes[2*]

Citation: McLeod M, Ahmad R, Shebl NA, Micallef C, Sim F, Holmes A (2019) A whole-health–economy approach to antimicrobial stewardship: Analysis of current models and future direction. PLoS Med 16(3): e1002774. https://doi.org/10.1371/journal.pmed.1002774

Table 1. Critical health system functions and elements of integration adapted from Atun and colleagues [16,18] for AMS initiatives.

Facets of Critical Health System Function	Elements of Integration Adapted for AMS Initiatives
Stewardship and governance	• Regulatory mechanism • Accountability framework
Financing	• Pooling of funds • Provider payment methods • Funding source • Cross-program use of funds
Planning	• Planning
Service delivery	• Human resources for delivery of AMS • Physical infrastructure for laboratory testing
Monitoring and evaluation	• Data collection and recording • Data analysis • Reporting systems • Performance management system
Demand generation	• Financial incentives • Information, education, and communication

Definition of full and partial integration: An element was classed as fully or predominantly integrated across the health system if it was exclusively under the management and control of the wider healthcare system. An element was classed as partially integrated if some but not all cases were managed and controlled both by the wider healthcare system and a specific program-related structure. A dimension was not integrated if it was exclusively under the management and control of a specific program-related structure (which is distinct from the wider healthcare system).

Abbreviations: AMS, antimicrobial stewardship.

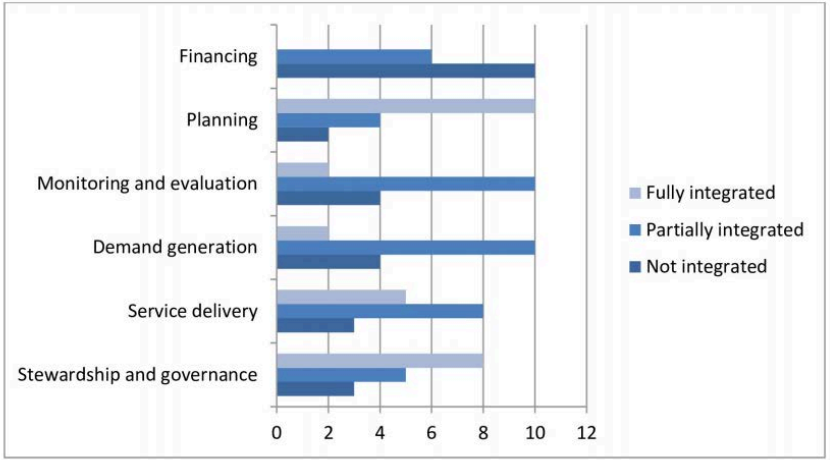
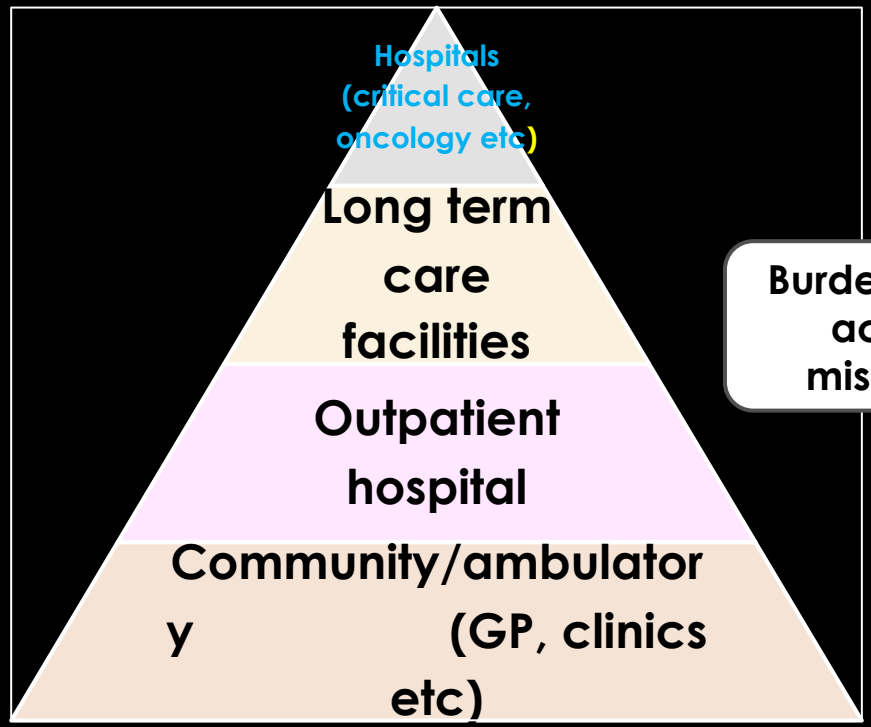


Fig 1. An overview of the extent of multisectoral AMS integration for each of the 16 AMS initiatives identified. The integration framework is based on all six facets of critical health system function defined by Atun and colleagues [16,18] (Table 1). AMS, antimicrobial stewardship.

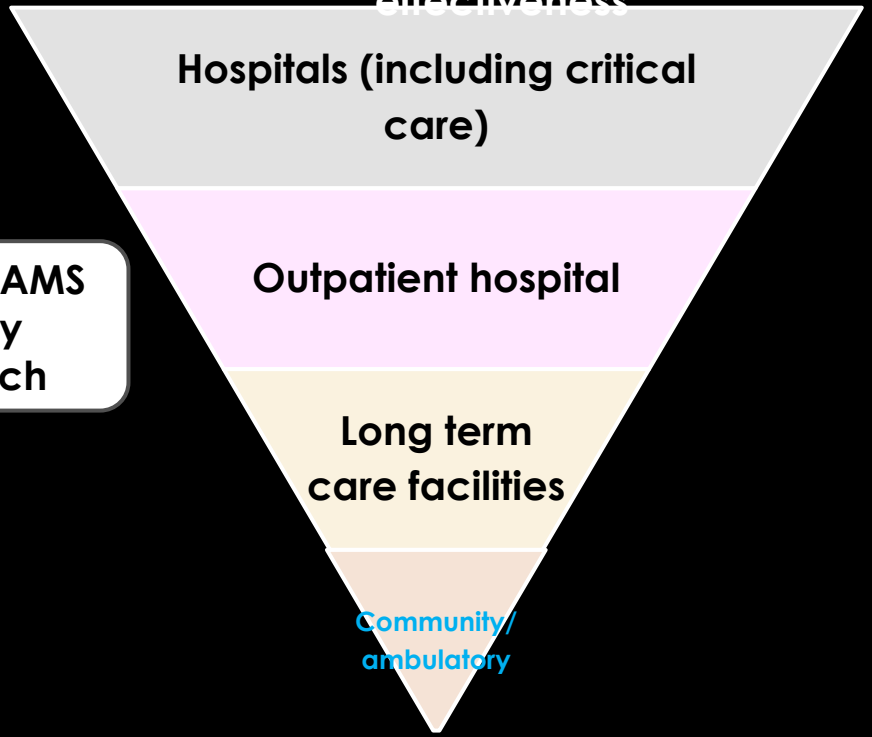
AMS Initiative
Australia
Canada
Greece
Italy
Sweden
United Kingdom
United States of America
Zambia

Human Antimicrobial Stewardship

~ 80% OF AMS SHOULD BE IN COMMUNITY & 20% IN THE HOSPITALS



Burden v AMS activity mismatch



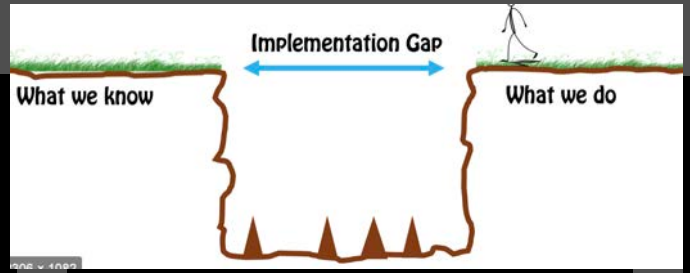


Table 14. National Monitoring System for Antimicrobials Use/Consumption - Human Health

	Level 1	Level 2	Level 3	Level 4	Level 5	No Response
Global (N)	45 (29.22%)	37 (24.03%)	26 (16.88%)	15 (9.74%)	27 (17.53%)	4 (2.6%)
Region						
AFR (n)	13 (44.83%)	10 (34.48%)	4 (13.79%)	1 (3.45%)	0 (0%)	1 (3.45%)
AMER (n)	13 (46.43%)	3 (10.71%)	7 (25%)	3 (10.71%)	1 (3.57%)	1 (3.57%)
EMR (n)	6 (35.29%)	5 (29.41%)	4 (23.53%)	1 (5.88%)	0 (0%)	1 (5.88%)
EUR (n)	3 (6%)	11 (22%)	10 (20%)	6 (12%)	19 (38%)	1 (2%)
SEAR (n)	4 (36.36%)	6 (54.55%)	0 (0%)	1 (9.09%)	0 (0%)	0 (0%)
WPR (n)	6 (31.58%)	2 (10.53%)	1 (5.26%)	3 (15.79%)	7 (36.84%)	0 (0%)

MONITORING GLOBAL PROGRESS ON ADDRESSING ANTIMICROBIAL RESISTANCE

Analysis report of the second round of results of AMR country self-assessment survey 2018

Published by
the Food and Agriculture Organization of the United Nations
and
the World Organisation for Animal Health
and
the World Health Organization

Food and Agriculture Organization of the United Nations

WORLD ORGANISATION FOR ANIMAL HEALTH

World Health Organization

Table 10. Training and Professional Education on AMR - Human Health

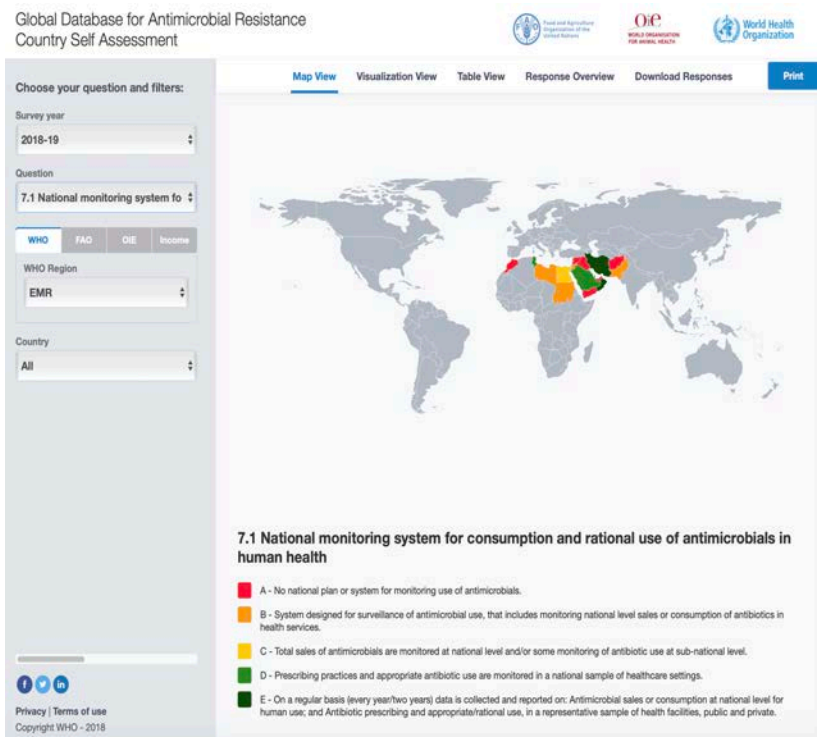
	Level 1	Level 2	Level 3	Level 4	Level 5	No Response
Global (N)	17 (11.04%)	35 (22.73%)	60 (38.96%)	25 (16.23%)	13 (8.44%)	4 (2.6%)
Region						
AFR (n)	11 (37.93%)	3 (10.34%)	12 (41.38%)	0 (0%)	2 (6.9%)	1 (3.45%)
AMER (n)	0 (0%)	10 (35.71%)	17 (60.71%)	0 (0%)	1 (3.57%)	0 (0%)
EMR (n)	2 (11.76%)	5 (29.41%)	5 (29.41%)	3 (17.65%)	0 (0%)	2 (11.76%)
EUR (n)	1 (2%)	9 (18%)	15 (30%)	14 (28%)	10 (20%)	1 (2%)
SEAR (n)	2 (18.18%)	3 (27.27%)	5 (45.45%)	1 (9.09%)	0 (0%)	0 (0%)
WPR (n)	1 (5.26%)	5 (26.32%)	6 (31.58%)	7 (36.84%)	0 (0%)	0 (0%)

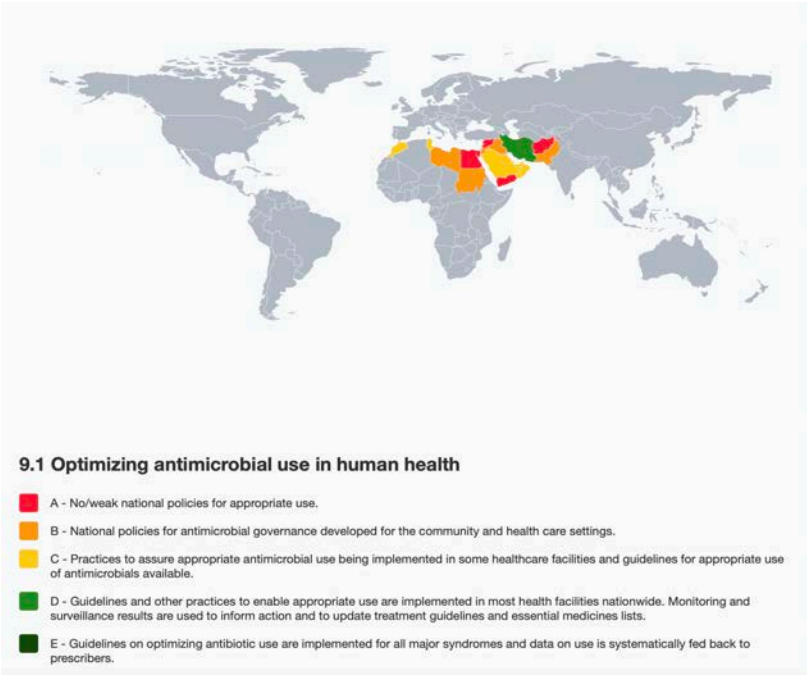
Table 25. Optimizing Antimicrobial Use - Human Health

	Level 1	Level 2	Level 3	Level 4	Level 5	No Response
Global (N)	25 (16.23%)	23 (14.94%)	61 (39.61%)	34 (22.08%)	7 (4.55%)	4 (2.6%)
Region						
AFR (n)	8 (27.59%)	6 (20.69%)	11 (37.93%)	2 (6.9%)	0 (0%)	2 (6.9%)
AMER (n)	8 (28.57%)	2 (7.14%)	15 (53.57%)	2 (7.14%)	0 (0%)	1 (3.57%)
EMR (n)	2 (11.76%)	4 (23.53%)	9 (52.94%)	2 (11.76%)	0 (0%)	0 (0%)
EUR (n)	3 (6%)	6 (12%)	18 (36%)	16 (32%)	6 (12%)	1 (2%)
SEAR (n)	2 (18.18%)	5 (45.45%)	2 (18.18%)	2 (18.18%)	0 (0%)	0 (0%)
WPR (n)	2 (10.53%)	0 (0%)	6 (31.58%)	10 (52.63%)	1 (5.26%)	0 (0%)

Level 1	Level 2	Level 3	Level 4	Level 5
No national AMR action plan.	National AMR action plan under development	National AMR action plan developed.	National AMR action plan approved by government that reflects Global Action Plan objectives, with an operational plan and monitoring arrangements.	National AMR action plan has funding sources identified, is being implemented and has relevant sectors involved with a defined monitoring and evaluation process in place.

IMPLEMENTION OF CORE COMPONENTS OF AMS
- CONSUMPTION SURVEILLANCE AND AMS PRACTICE





Government policy interventions to reduce human antimicrobial use: A systematic review and evidence map

Citation: Rogers Van Katwyk S, Grimshaw JM, Nkangu M, Nagi R, Mendelson M, Taljaard M, et al. (2019) Government policy interventions to reduce human antimicrobial use: A systematic review and evidence map. PLoS Med 16(6): e1002819. https://doi.org/10.1371/journal.pmed.1002819

Table 2

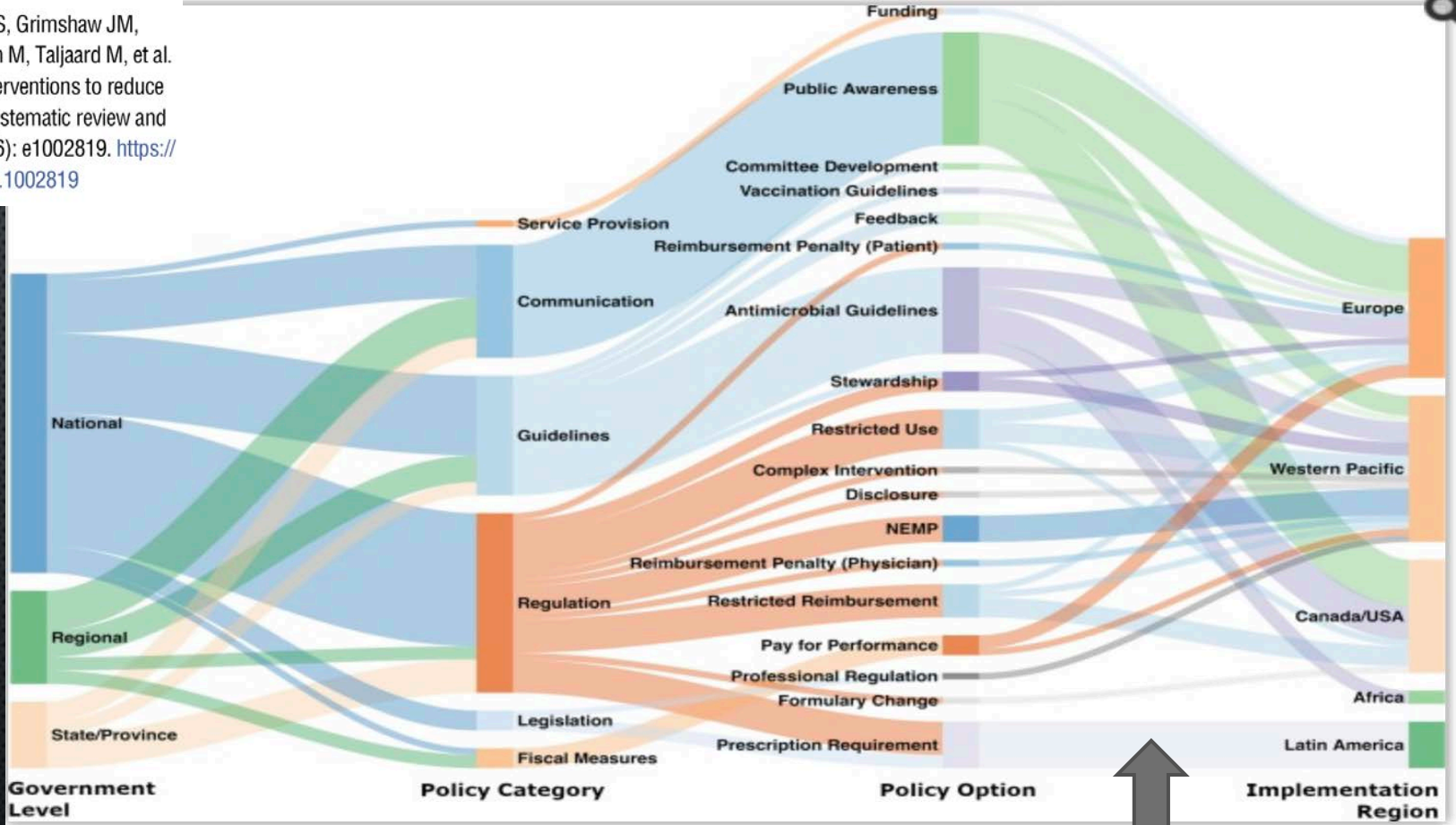
Description of policy options that have aimed to reduce human antimicrobial consumption.

Policy option	Description	Studies
Policies to improve infection prevention and stewardship efforts		
Published antimicrobial guidelines	Information provided to healthcare workers on the preferred use of antimicrobial drugs, or preferred treatment for resistant infections	[50–53,55,57–64]
Vaccination guidelines	Guidelines and policies recommending vaccinations likely to reduce antimicrobial use	[90]
Committee development	Guidelines encouraging the formation of expert groups on stewardship and resistance	[56]
Stewardship	A requirement that specific stewardship policies be introduced	[27,33,65]
Disclosure	A requirement for public disclosure of antibiotic use level	[32]
Funding	Provision of funding towards a specific stewardship program or goal	[88]
Policies to educate health professionals, policy makers, and the public on sustainable antibiotic use		
Public awareness	Public educational campaigns drawing on media and internet to inform healthcare workers and/or the public about antimicrobial resistance	[68–84]
Feedback	Audit and feedback to providers about their antimicrobial use habits	[54,66]
Policies to change incentives that encourage antibiotic overuse and misuse		
Reimbursement penalty for patients	A reduction in the amount that a patient is reimbursed for a prescription by a drug plan	[41]
Reimbursement penalty for prescribers	The prescriber is not paid for their services unless the guidelines for prescribing antimicrobials are met	[26]
Restricted reimbursement	Introduces an additional step in the prescribing pathway such as consultation with a specialist or provision of proof of infection in order for the prescription to be reimbursed	[30,31,34,36,38]
Restricted use	Introduces an additional step in the prescribing pathway such as consultation with a specialist or provision of proof of infection in order for the prescription to be dispensed	[23,28,35,43,47,48]
Pay for performance	Pay-for-performance funding provided to healthcare centres that meet particular antimicrobial-use-related guidelines and targets	[67,89,91]
Policies to change features of the health system		
Professional regulation	Changes to codes of practice with regards to what can be done by members of different healthcare professions	[87]
Prescription requirement	Requirement of a prescription to purchase antimicrobial drugs	[24,25,39,40,44,85,86]
Formulary change	Removal of a drug from the formulary or addition of a drug to the formulary	[37]
National essential medicines policies	Introduction of policies in line with WHO's essential medicines policies	[29,45,46,49]

https://doi.org/10.1371/journal.pmed.1002819.t002

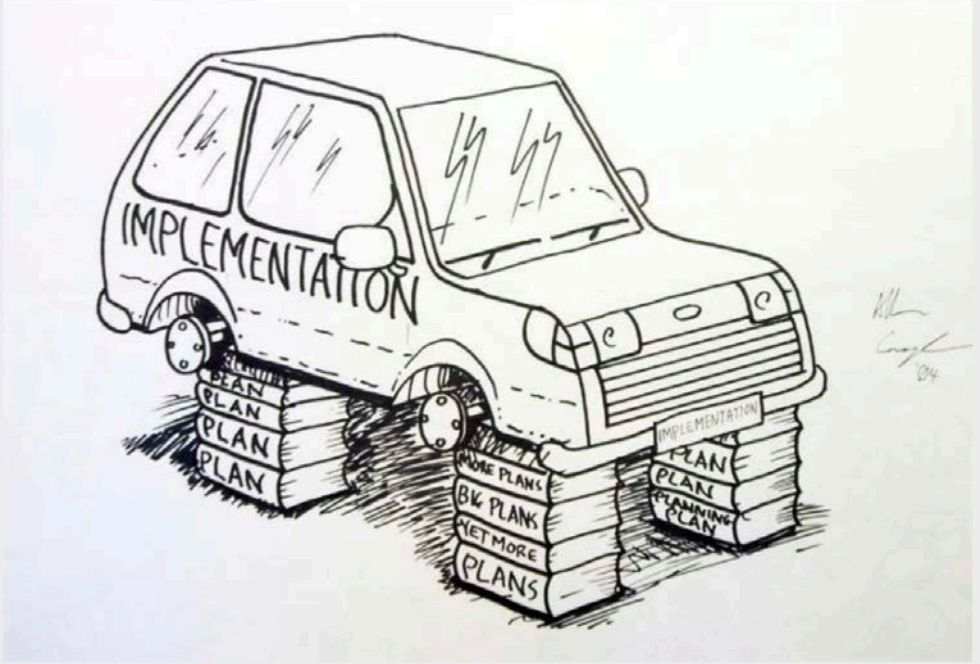
doi: https://doi.org/10.1371/journal.pmed.1002819.t002

Citation: Rogers Van Katwyk S, Grimshaw JM, Nkangu M, Nagi R, Mendelson M, Taljaard M, et al. (2019) Government policy interventions to reduce human antimicrobial use: A systematic review and evidence map. PLoS Med 16(6): e1002819. https://doi.org/10.1371/journal.pmed.1002819



Evidence map of the relationships between government level, policy approach (policy category), policy option, and region of implementation.

What the implementation gap looks like...and how it stops progress



UNDERSTAND BARRIERS AND SOLUTIONS

The Need to Study Implementation

On average, it takes 17 years for evidence-based practices to be incorporated into routine care.

Efficacy and effectiveness trials → **Sustained application in routine care**

Lack of awareness
Competing demands
Limited resources and skills
Misalignment of priorities

Balas EA, Boren SA, *Yearb Med Inform* 2000, 1: 65-70; Bauer MS, et al. *BMC Psychology* 2015, 3:32

What % of key healthcare evidence based interventions are actually implemented in routine American medical healthcare ?

Defining Implementation Science

Definition: "The scientific study of methods to promote the systematic uptake of research findings and other evidence-based practices into routine practice, and, hence, to improve the quality and effectiveness of health services" (Eccles MP, Mittman BS. Implement Sci 2006; 1:1.)

Implementation scientists want to know:

1) why evidence-based practices are adopted,
2) how they're adapted to fit a specific context, and
3) how the pace of adoption can be accelerated.

Are you Happy with that For your Organisation ?

Table 3. Adherence to Quality Indicators, Overall and According to Type of Care and Function.

Variable	No. of Indicators	No. of Participants Eligible	Total No. of Times Indicator Eligibility Was Met	Percentage of Recommended Care Received (95% CI)*
Overall care	439	6712	98,649	54.9 (54.3–55.5)
Type of care				

Table 5. Adherence to Quality Indicators, According to Condition.*

Condition	No. of Indicators	No. of Participants Eligible	Total No. of Times Indicator Eligibility Was Met	Percentage of Recommended Care Received (95% CI)
Coronary artery disease	37	410	2083	68.0 (64.2–71.8)
Hypertension	27	1973	6643	64.7 (62.6–66.7)
Congestive heart failure	36	104	1438	63.9 (55.4–72.4)
Cerebrovascular disease	10	101	210	59.1 (49.7–68.4)
Chronic obstructive pulmonary disease	20	169	1340	58.0 (51.7–64.4)
Colorectal cancer	12	231	329	53.9 (47.5–60.4)
Asthma	25	260	2332	53.5 (50.0–57.0)

McGlynn EA. The Quality of Health Care Delivered to Adults in the United States. NEJM 2003.

Clinical Infectious Diseases

IDSA GUIDELINE

Implementing an Antibiotic Stewardship Program: Guidelines by the Infectious Diseases Society of America and the Society for Healthcare Epidemiology of America

Tamar F. Barlam,[1,a] Sara E. Cosgrove,[2,a] Lilian M. Abbo,[3] Conan MacDougall,[4] Audrey N. Schuetz,[5] Edward J. Septimus,[6] Arjun Srinivasan,[7] Timothy H. Dellit,[8] Yngve T. Falck-Ytter,[9] Neil O. Fishman,[10] Cindy W. Hamilton,[11] Timothy C. Jenkins,[12] Pamela A. Lipsett,[13] Preeti N. Malani,[14] Larissa S. May,[15] Gregory J. Moran,[16] Melinda M. Neuhauser,[17] Jason G. Newland,[18] Christopher A. Ohl,[19] Matthew H. Samore,[20] Susan K. Seo,[21] and Kavita K. Trivedi[22]

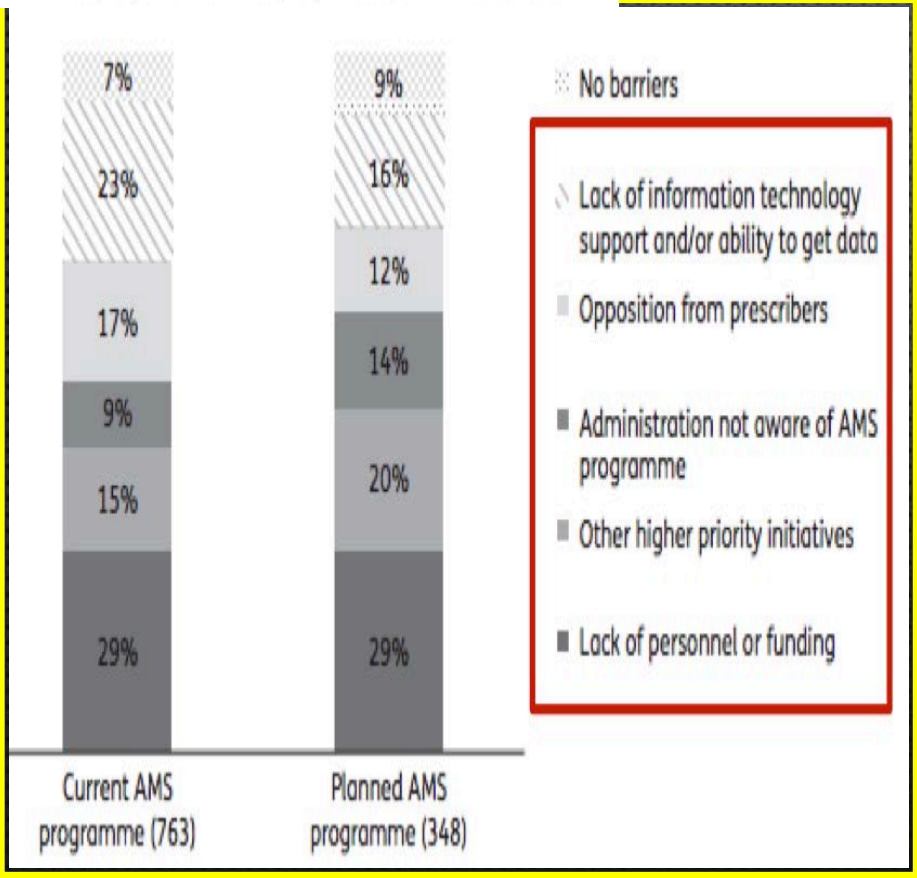
[1]Section of Infectious Diseases, Boston University School of Medicine, Boston, Massachusetts; [2]Division of Infectious Diseases, Johns Hopkins University School of Medicine, Baltimore, Maryland; [3]Division of Infectious Diseases, University of Miami Miller School of Medicine, Miami, Florida; [4]Department of Clinical Pharmacy, School of Pharmacy, University of California, San Francisco; [5]Department of Medicine, Weill Cornell Medical Center/New York–Presbyterian Hospital, New York, New York; [6]Department of Internal Medicine, Texas A&M Health Science Center College of Medicine, Houston; [7]Division of Healthcare Quality Promotion, Centers for Disease Control and Prevention, Atlanta, Georgia; [8]Division of [illegible] and Infectious Diseases, University of Washington

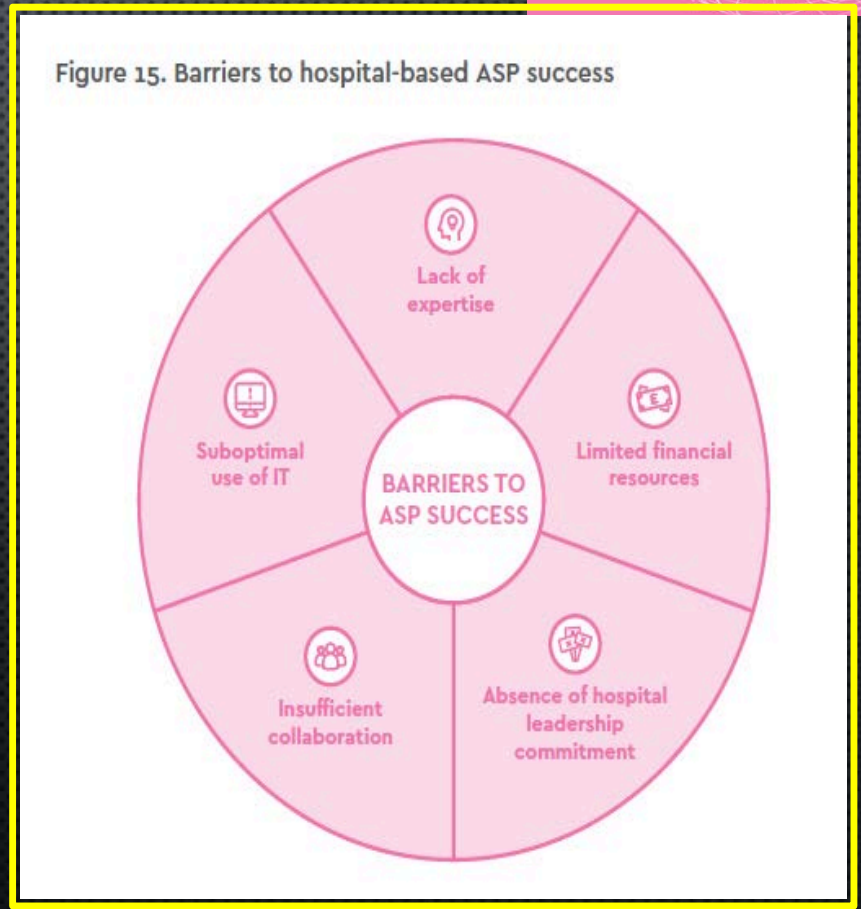
"Another significant [research] gap is the dearth of implementation research in this area….little effort and limited research funding have been allocated to study how best to achieve **large-scale implementation** [of ASPs]."

An international cross-sectional survey of antimicrobial stewardship programmes in hospitals

J Antimicrob Chemother 2015; **70**: 1245–1255

P. Howard[1*], C. Pulcini[2,3], G. Levy Hara[4], R. M. West[5], I. M. Gould[6], S. Harbarth[7] and D. Nathwani[8] on behalf of the ESCMID Study Group for Antimicrobial Policies (ESGAP) and ISC Group on Antimicrobial Stewardship





OVERVIEW: IMPLEMENTATION & IMPROVEMENT SCIENCES

Implementation Science
Focuses on optimal strategies to promote evidence uptake in real-world settings

Addresses
Did stakeholders perform the desired endeavor?
Why or why not?
How well?

Improvement Science
Focuses on rigorously measuring outcomes associated with efforts to improve care delivery

Addresses
Did the new endeavor measurably improve desired outcomes?

Aims

Translate research intro practice

Systematically implement evidence-based practices

Improve the quality of healthcare

"Its all about context- what works, why, where, whom, how long "

BOSTON UNIVERSITY

CIIS

The quality-improvement model in more detail

1 Prepare

- Map possible enablers (champions) and barriers in the unit.
- Obtain managers' and champions' commitment to change.
- Prepare to talk about AMR, the unit's antibiotic use and "what can be done" (AMS).

2 Plan

- Present the AMR problem, challenges in antibiotic use and discuss "what we can do".
- Set SMART goals for changing the unit's antibiotic use.
- Decide on AMS interventions, how to implement them and how to measure change.

3 Do

- Perform AMS interventions (e.g. education, ward rounds and audit) and measurements (AMS review form: see Annex IV).

4 Study

- Analyse the measures (process and outcome). What do they show?
- Evaluate AMS interventions and their implementation. To be continued or changed?
- Prepare to discuss the results, AMS interventions and implementation with the units.
- Review resource use and costs, and determine whether there have been savings.

5 Adjust

- Discuss the results and AMS interventions with the unit.
- Agree on any adjustments to the AMS interventions, implementation and measurements.
- Follow up with a continuous improvement cycle (Plan, Do, Study, Adjust).

Science of Improvement

Aim

What are we trying to accomplish?

"Some is not a number, soon is not a time... hope is not a plan"

Don Berwick IHI

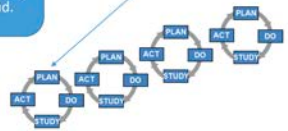
Change

What can we change that ~~will~~ MAY result in an improvement?

Measurement

How will we know that a change is an improvement?

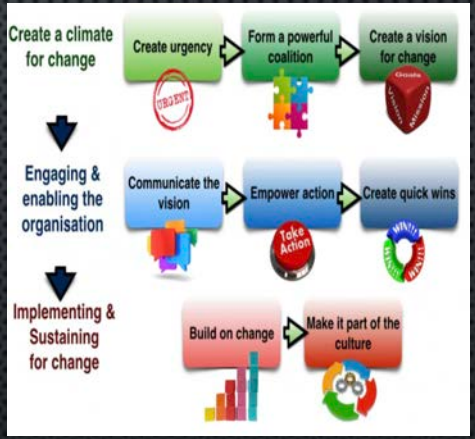
Not all change is an improvement – may need several rounds of testing ideas before spread.



8-Step Process for Leading Change Aligned with Antibiotic Stewardship/CDI Webinar with Arjun Srinivasan, MD, FSHEA

Building on our May 22 webinar, MetaStar offers this step-by-step crosswalk of the change model developed by John Kotter as applied to antibiotic stewardship.

8-Step Process for Leading Change	Description	Overview of Dr. Srinivasan's May 22, 2013, CDI Webinar as Related to Kotter's 8 Steps
Create a Sense of Urgency	• Engage hospital leadership. • Assemble a group (champions) with enough power to lead the change effort (change coalition). • Ask for an emotional commitment from these key people.	1. Improving antibiotic use is a public health imperative 2. We're running out of antibiotics to treat our patients 3. Improving antibiotic use improves patient outcomes and saves money 4. Antibiotics have side effects: *C. diff*
Form a Powerful Coalition	• Convince people that change is necessary. • Work on team building within your change coalition.	1. *Clostridium difficile* infections (CDIs) and deaths remain at historic highs 2. Comprehensive programs have consistently demonstrated a decrease in antimicrobial use with annual savings of $200,000 - $900,000
Create a Vision for Change	• Develop a short summary (one or two sentences) that captures what you "see" as the future of your organization. • Ensure that your change coalition can describe the vision in five minutes or less.	1. The goal of the stewardship program is not to dictate antibiotic choices 2. It's to ensure that there are systems and support to help every provider use antibiotics optimally 3. For this to work, every provider has to play a role in stewardship



8-Step Process for Leading Change Aligned with Antibiotic Stewardship/CDI Webinar with Arjun Srinivasan, MD, FSHEA

8-Step Process for Leading Change	Description	Overview of Dr. Srinivasan's May 22, 2013, CDI Webinar as Related to Kotter's 8 Steps
Communicate the Vision	• Talk often about your change vision. • Openly and honestly address peoples' concerns and anxieties. • Apply your vision to all aspects of operations – from training to performance reviews. Tie everything back to the vision.	1. Coach staff and physicians concurrently, as order is written 2. New diagnoses of *C. diff* present a critical moment for stewardship interventions 3. Measure and feedback of data
Remove Obstacles	• Put in place the structure for change, and continually check for barriers to it. • Removing obstacles can empower the people you need to execute your vision, and it can help the change move forward.	1. How do we structure specific interventions that can be implemented in any care setting? 2. How do we build interventions that fit well into clinical work flow? 3. How do we structure interventions so that they are viewed as value added and not just one more thing people have to do?
Create Short-term Wins	• Look for sure-fire projects that you can implement without help from any strong critics of the change. • Thoroughly analyze the potential pros and cons of your targets. If you don't succeed with an early goal, it can hurt your entire change initiative.	1. New diagnoses of *C. diff* present a critical moment for stewardship interventions. 2. Providers might be even more receptive to stewardship since their patient is experiencing an adverse event from antibiotics. 3. Stopping unnecessary antibiotics will improve their patients' outcomes. 4. Reward the people who help you meet the targets.

8-Step Process for Leading Change Aligned with Antibiotic Stewardship/CDI Webinar with Arjun Srinivasan, MD, FSHEA

8-Step Process for Leading Change	Description	Overview of Dr. Srinivasan's May 22, 2013, CDI Webinar as Related to Kotter's 8 Steps
Build on the Change	• Each success provides an opportunity to build on what went right and identify what you can improve. • After every win, analyze what went right and what needs improving. • Set goals to continue building on the momentum you've achieved. • Use plan-do-study-act (PDSA) cycles for continuous improvement. • Keep ideas fresh by bringing in new change agents and leaders for your change coalition.	1. Consider additional tests of change (PDSA) focused on different infections or conditions. Antibiotic stewardship: • Ensures patients with serious infections get proper therapy – positive blood cultures are an excellent target for stewardship interventions. • Can reduce treatment of blood culture contaminants. • Ensures patients with Community Acquired Pneumonia (CAP), urinary tract infections (UTI) and skin infections get proper therapy. ○ Many patients diagnosed with CAP don't meet criteria for CAP or CAP is treated for too long. ○ One-third of (UTI) patients who historically receive antibiotics do not meet the criteria for UTI. ○ Most skin and soft tissue infections in normal hosts with normal risk factors are caused exclusively by gram positive bacteria are often started on overly broad spectrum therapy.
Anchor the Changes in Corporate Culture	• To make any change stick, it should become part of the core of your organization • Talk about progress every chance you get. Tell success stories about the change process, and repeat other stories that you hear. • Publicly recognize key members of your original change coalition	1. Change the culture so that antibiotic stewardship is incorporated into your organization's processes and values 2. Provide ongoing education 3. Spread the message: pocket cards posters, algorithms 4. Celebrate

References:

Kotter International: http://www.kotterinternational.com/our-principles/changestepsMay 22, 2013, Webinar: Two Birds With One Stone: Reducing Unnecessary Antibiotic Use and *C. difficile* Infections (CDI): http://www.metastar.com/web/Default.aspx?tabid=328

This material was prepared by MetaStar, the Medicare Quality Improvement Organization for Wisconsin, under contract with the Centers for Medicare & Medicaid Services (CMS), an agency of the U.S. Department of Health and Human Services. The contents presented do not necessarily reflect CMS policy. 10SOW-WI-HAI-13-51

Establishing an Antimicrobial Stewardship Program

Andrew M. Morris, Thomas E. Stewart, Maureen Shandling, Scott McIntaggart and W. Conrad Liles

Healthcare Quarterly 13(2) March 2010 : 64-70.doi:10.12927/hcq.2013.21672

HOW TO START A HOSPITAL ANTIMICROBIAL STEWARDSHIP PROGRAMME: H-ASP

PLANNING PHASE MONTH 1-2

Depends on resources, readiness, culture, priority, etc

80% PLANNING

Prepare- training in AMS/infection management

- Toolbox of AMS interventions [process- adapt, endorse, adopt]
- Seek multi-stakeholders support, especially clinicians, hospital leadership
- Be familiar with core elements and checklist
- Be familiar with regional/national plans, regulations, requirements
- Assess local situation[SWOT analysis- use checklist]
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- Start to design an action plan- see WHO LMIC tool kit
- Embrace/seek QI/implementation science resource if available
- Consider monitoring/ dissemination, evaluation and communication plan

20% IMPLEMENTATION

How to start an antimicrobial stewardship programme in a hospital

M. Mendelson, Clin Microbiol Infect 2019;▪:1

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World Health Organization

ANTIMICROBIAL STEWARDSHIP PROGRAMMES IN HEALTH-CARE FACILITIES IN LOW- AND MIDDLE-INCOME COUNTRIES

A WHO PRACTICAL TOOLKIT

Suggested citation. Antimicrobial stewardship programmes in health-care facilities in low- and middle-income countries. A practical toolkit. Geneva: World Health Organization; 2019.
Licence: CC BY-NC-SA 3.0 IGO.

AMS: STRUCTURE + PROCESS = OUTCOMES

Position paper

Developing core elements and checklist items for global hospital antimicrobial stewardship programmes: a consensus approach

C. Pulcini [1, 2, *], F. Binda [1, 2, 3], A.S. Lamkang [4], A. Trett [4], E. Charani [5], D.A. Goff [6], S. Harbarth [7], S.L. Hinrichsen [8], G. Levy-Hara [9], M. Mendelson [10], D. Nathwani [11], R. Gunturu [12], S. Singh [13], A. Srinivasan [14], V. Thamlikitkul [15], K. Thursky [16], E. Vlieghe [17, 18, 19], H. Wertheim [20], M. Zeng [21], S. Gandra [4], R. Laxminarayan [4, 22]

Core elements:

1. Senior hospital management leadership towards AMS
2. Accountabilities and responsibilities
3. Available expertise on infection management
4. Education and practical training
5. Other actions aiming at responsible antimicrobial use
6. Monitoring and surveillance (on a continuous basis)
7. Reporting and feedback (on a continuous basis)

Clinical Microbiology and Infection 25 (2019) 20–25

HOW TO START A HOSPITAL ANTIMICROBIAL STEWARDSHIP PROGRAMME: H-ASP

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20% IMPLEMENTATION

How to start an antimicrobial stewardship programme in a hospital

M. Mendelson, Clin Microbiol Infect 2019;▪:1

SWOT ANALYSIS / SITUATIONAL ANALYSIS

Suggested reference for this report: Ribero Pombo MH, Gandra S, Thompson D, Lamkang A, Pulcini C, Laxminarayan R. Global Core Standards for Hospital Antimicrobial Stewardship Programs: International Perspectives and Future Directions. Doha, Qatar: World Innovation Summit for Health, 2018

ISBN: 978-1-912865-11-6

- ORGANISATIONAL, OPERATIONAL OR POPULATION LEVEL DECISION MAKING PROCESS USED TO DECIDE WHETHER TO TAKE A RISK OR UNDERSTAND THE LEVEL OF RISK ASSOCIATED WITH A HEALTH-CARE INTERVENTION

HOW TO START A HOSPITAL ANTIMICROBIAL STEWARDSHIP PROGRAMME: H-ASP

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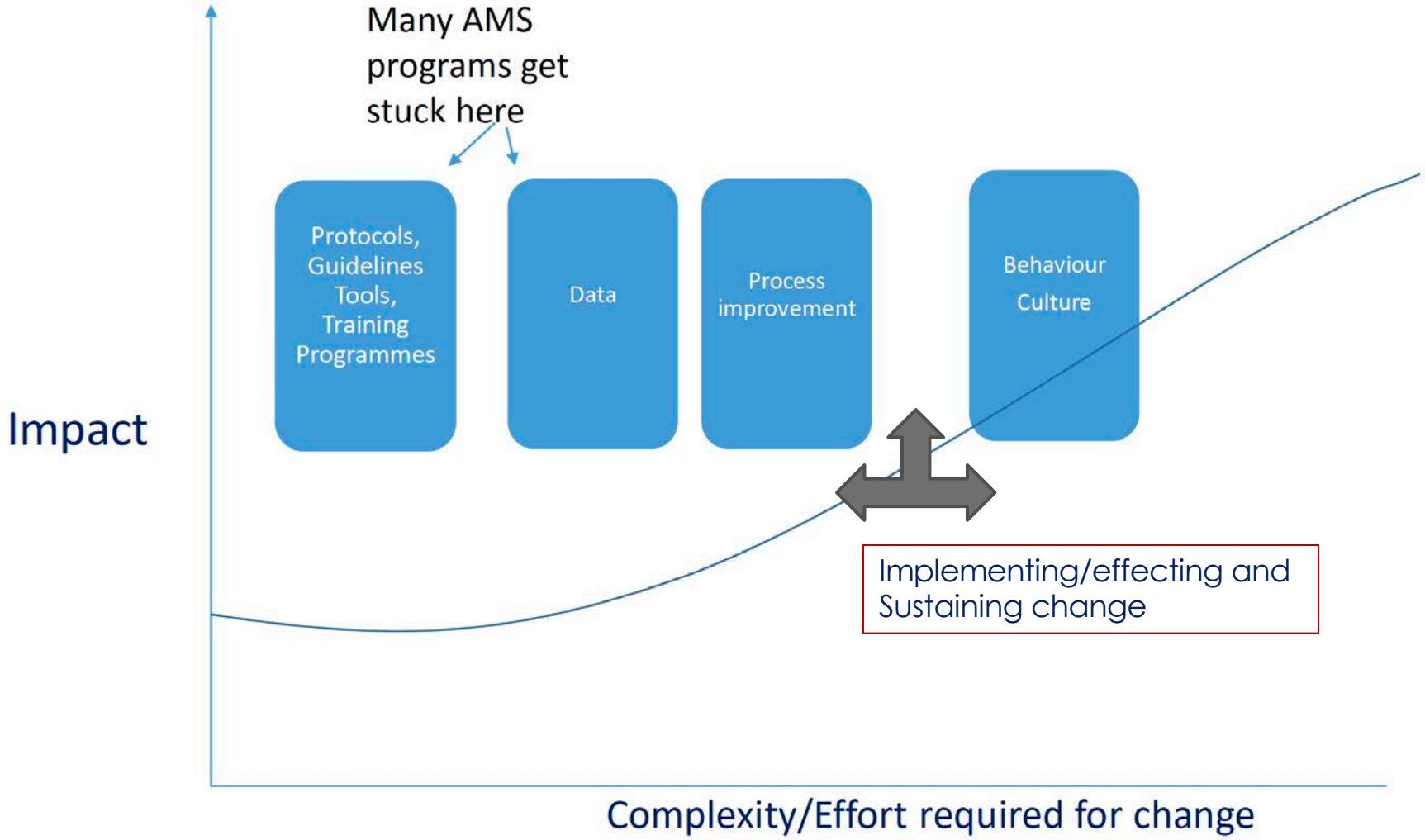
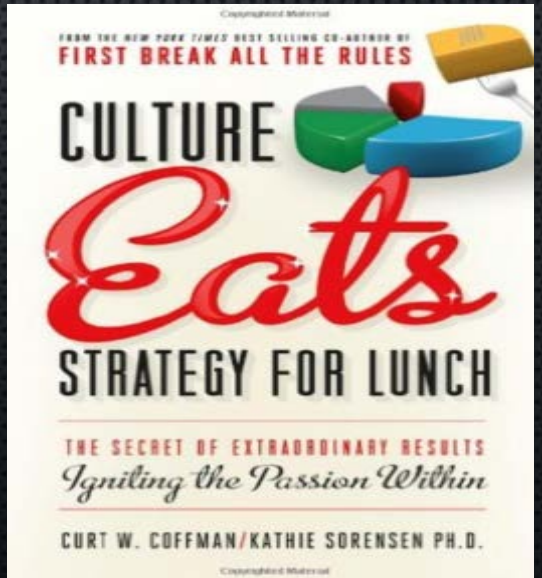

Many AMS programs get stuck here
Protocols, Guidelines Tools, Training Programmes
Data
Process improvement
Behaviour Culture
Impact
Implementing/effecting and Sustaining change
Complexity/Effort required for change

Figure 2: Dimensions needed to achieve clinical quality improvement

Strategic	×	Cultural	×	Technical	×	Structural	=	Result
0		1		1		1	=	No significant results on anything really important
1		0		1		1	=	Small, temporary effects; no lasting impact
1		1		0		1	=	Frustration and false starts
1		1		1		0	=	Inability to capture the learning and spread it throughout the organisation
1		1		1		1	=	Lasting organisation-wide impact
0 = absent; 1 = fully present								



Meropenem
+Vanco

Pip-Tazo
+ Cipro

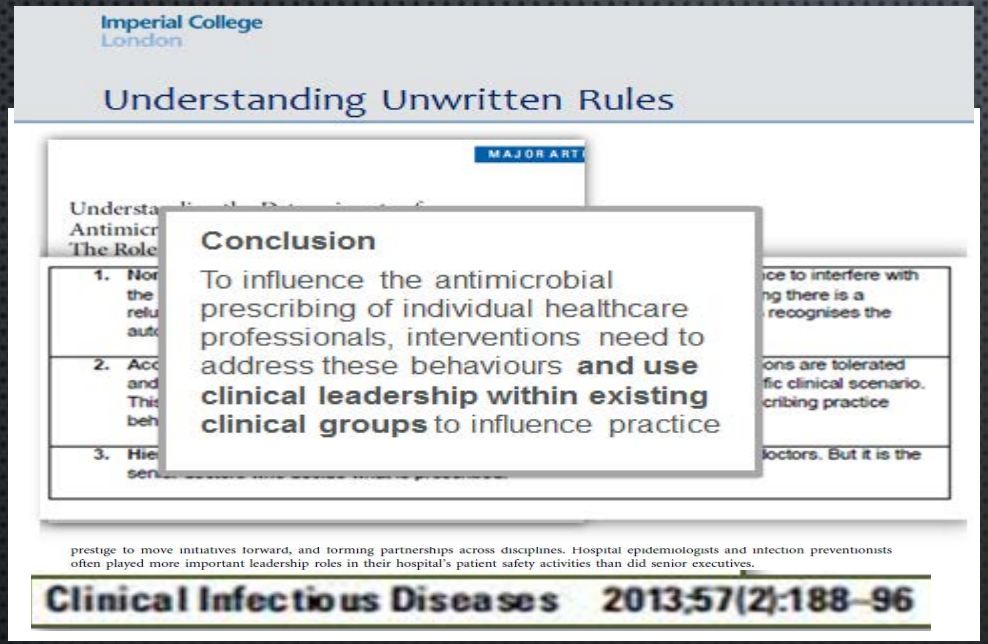
Imipenem+
linezolid

Cefepime

Ceftazidime
+Clindamycin
+ Gentamicin
+ Caspofungin
+linezolid

watch and wait
a bit

CONSIDER THE BROADER LEADERSHIP


Imperial College London

Understanding Unwritten Rules

Conclusion

To influence the antimicrobial prescribing of individual healthcare professionals, interventions need to address these behaviours **and use clinical leadership within existing clinical groups** to influence practice

prestige to move initiatives forward, and forming partnerships across disciplines. Hospital epidemiologists and infection preventionists often played more important leadership roles in their hospital's patient safety activities than did senior executives.

Clinical Infectious Diseases 2013;57(2):188–96

- MUCH FOCUS ON LEADERSHIP……
- BUT LESS ON HOW TO USE CLINICAL LEADERS…..
- ***ACTIVELY INVOLVE CLINICAL LEADERS IN ANTIBIOTIC STEWARDSHIP***

Clinical leaders

MDT leaders

HOW TO START A HOSPITAL ANTIMICROBIAL STEWARDSHIP PROGRAMME: H-ASP

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HOW TO START A HOSPITAL ANTIMICROBIAL STEWARDSHIP PROGRAMME: H-ASP

EARLY IMPLEMENTATION PHASE MONTH 3-4

Depends on resources, readiness, culture, priority, etc

40% PLANNING

- Resources – human capital, fiscal, QI- implementation science, data collection/analysis
- Step Wise approach – plan core areas for early interventions, the measures for target, and so this step wise
- ***Identify which patients are getting antibiotics, how much, where and quality of the prescribing; use audit, PPS etc***
- ***Based on data and observations identify which areas to target- consider the "low hanging fruit",***
- Agree which types of interventions or processes to implement- persuasive, restrictive, enabling, educational, bundles
- Agree which measures [what, who, how, where and when] for evaluation- ensure resources available- IT not essential to do this
- Be available to support team, clinicians for advice etc –"go on the improvement journey together

60% IMPLEMENTATION

How to start an antimicrobial stewardship programme in a hospital
M. Mendelson, Clin Microbiol Infect 2019;■:1

AUDIT/REVIEW METHODS TO UNDERSTAND PROBLEM AREAS

Health-care facility PPS

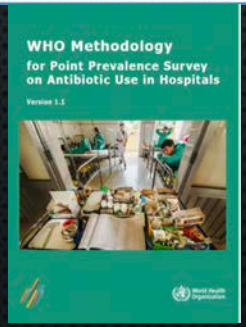
Step 1: Structures and governance
- Identify the team/committee in the facility with the overarching responsibility of the PPS, often the committee also responsible for AMS
- As part of this team/committee, appoint a facility PPS focal point responsible for the coordination and the day-to-day management of the survey

Step 2: Objectives and methodology
- Define the objectives and output of the PPS in the facility
- Select a standardized PPS protocol to for the survey, e.g. WHO PPS protocol, Global PPS.
- Train the hospital PPS focal point and team in the methodology

Step 3: Preparation
- Obtain ethical approval and other necessary permissions to undertake the survey
- Agree on the days to conduct the surveys in the respective wards
- Prepare the necessary materials for undertaking the survey

Step 4: Data collection and validation
- Undertake a pilot survey in one ward and validate the data
- Conduct the survey in all wards according to predefined timelines
- Transfer data from paper form to electronic format when applicable, and validate the data.

Step 5: Data analyses and reporting
- Clean and analyse the data according to a pre-defined data analysis plan
- Report results to the responsible team/committee, the facility management etc..
- Identify areas for improvement for antimicrobial prescribing and use based on results and agree on AMS interventions to address these areas
- Monitor and evaluate the AMS interventions with e.g. a targeted PPS or audits or audits



5.8. Audit with feedback

5.8.1 Prospective (real-time) audit with feedback

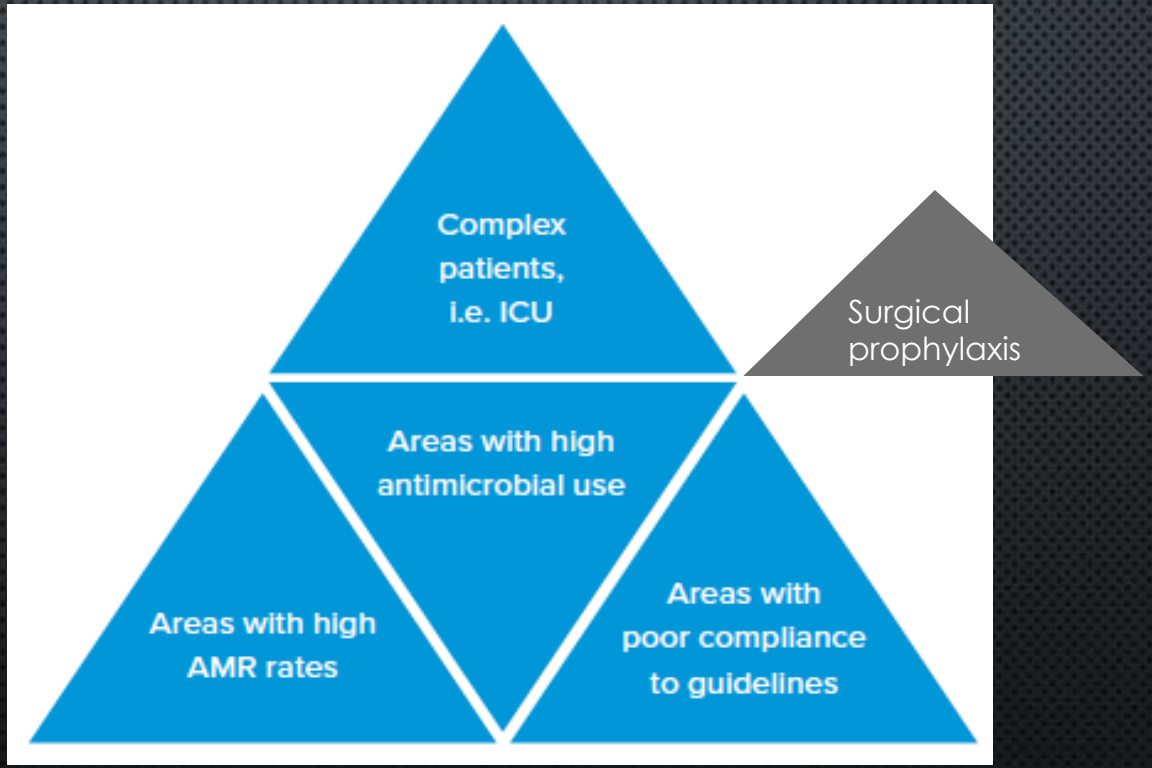
5.8.2 Retrospective audit with feedback

5.8.3 Selecting one or more infections for audit

Point prevalence surveys

Local point prevalence surveys (PPS) are recommended on a bi-annual or annual basis(5) as a tool to assess compliance with antimicrobial guidelines. Results of PPS should be shared with the executive team and disseminated to specialities who are responsible for developing action plans within their area. Key metrics which should be included in PPS are shown in figure 23

IDENTIFY PRIORITY AREAS FOR AMS INTERVENTIONS- USE ANTIMICROBIAL USE/ QUALITY DATA OR RESISTANCE DATA OR AREAS WHERE PATIENTS AT HIGH RISK OF AMR



http://bsac.org.uk/antimicrobial-stewardship-from-principles-to-practice-e-book/

Is the "Low-Hanging Fruit" Worth Picking for Antimicrobial Stewardship Programs?

Debra A. Goff,[1] Karri A. Bauer,[1] Erica E. Reed,[1] Kurt B. Stevenson,[2,3] Jeremy J. Taylor,[1] and Jessica E. West[2]

[1]Department of Pharmacy, The Ohio State University Wexner Medical Center, [2]Division of Infectious Diseases, College of Medicine, and [3]Division of Epidemiology, College of Public Health, The Ohio State University, Columbus

PRIORITISING AMS INTERVENTIONS

TYPES OF LOW HANGING FRUIT

- **PROTOCOL DRIVEN EMPIRIC TREATMENT WITH ADHERENCE**
- LOADING DOSE IN SEVERE INFECTIONS
- TAKING OF CULTURES
- **DE-ESCALATION**
- **IV TO ORAL SWITCH WITH A VIEW TO EARLY DISCHARGE**
- DURATION ; < 7 DAYS ; < 14 DAYS
- **SURGICAL PROPHYLAXIS**

Basic AMS interventions

1. Educate prescribers and health personnel involved in antibiotic use (see Chapter 7).
2. Develop and update a standardized medical record and medical chart to ensure that information on patients' medicines is all in one place (see Annex VI).
3. Review whether patients who receive antibiotic treatment have written indications.
4. Review antibiotic treatment for patients prescribed three or more broad-spectrum antibiotics.
5. Review the dose of antibiotics prescribed.
6. Review surgical antibiotic prophylaxis where it is prescribed for >24 hours and where a single dose is appropriate.
7. Develop local guidelines for surgical prophylaxis and treatment of common clinical conditions such as community-acquired pneumonia, UTIs, skin and soft tissue infection (SSTIs), as well as common health-care-associated infections such as pneumonia, UTIs and catheter-related infections.
8. Work to ensure leadership and identify expertise in infection management.
9. Improve the supply and management of medicines, including essential antibiotics, e.g. by establishing a drug and therapeutics committee.
10. Work to establish basic microbiology laboratory facilities.
11. Work to establish regular surveillance activities (e.g. AMR, AMC, health-care-associated infections).

Suggested citation. Antimicrobial stewardship programmes in health-care facilities in low- and middle-income countries. A practical toolkit. Geneva: World Health Organization; 2019.
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HOW TO START A HOSPITAL ANTIMICROBIAL STEWARDSHIP PROGRAMME: H-ASP

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60% IMPLEMENTATION

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M. Mendelson, Clin Microbiol Infect 2019;▪:1

THE FOUR MOMENTS OF ANTIBIOTIC DECISION-MAKING

1. Does my patient have an infection that requires antibiotics?

2. Have I ordered appropriate cultures before starting antibiotics? What empiric therapy should I initiate?
3. A day or more has passed. Can I stop antibiotics? Can I narrow therapy or change from IV to oral therapy?
4. What duration of antibiotic therapy is needed for my patient's diagnosis?

Types of AMS interventions for improving antibiotic prescribing practices

INTERVENTION	WHAT IT IS
Persuasive (education)	• Educational meetings (e.g. basics on antibiotic use, case-based discussions, morbidity and mortality, significant event analysis, lectures on specified topics) • Distribution of and training on educational material (e.g. clinical practice guidelines) • Using local key opinion leaders (champions) to advocate for key messages • Reminders provided verbally, on paper or electronically • AMS e-learning resources made available to all health-care personnel • AMS education as part of continuing medical education
Persuasive (feedback)	• Audit with feedback to prescribers on their prescribing practice • AMS as a component of ward rounds (real-time feedback with educational component) • Patient handover meetings between two shifts with real-time feedback by consultants • Local consensus processes for changes in antibiotic treatment or surgical prophylaxis
Restrictive	• Formulary restrictions • Restricted prescribing of identified antibiotics (expert approval prior to prescription) (see Annex V) • Compulsory order forms for targeted antibiotics • Automatic stop orders (e.g. after a single dose of surgical prophylaxis) • Selective susceptibility reporting from the lab
Structural	• Rapid laboratory testing made available • Therapeutic drug monitoring

Suggested citation. Antimicrobial stewardship programmes in health-care facilities in low- and middle-income countries. A practical toolkit. Geneva: World Health Organization; 2019.
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TYPICAL AMS INTERVENTIONS

CORE	ADDITIONAL
FORMULARY RESTRICTION WITH RE-AUTHORISATION OF NAMED ANTI-INFECTIVES	DE-ESCALATION OF THERAPY BASED ON CULTURE RESULTS
PROSPECTIVE AUDIT WITH INTERVENTION AND FEEDBACK	DOSE OPTIMISATION
MULTIDISCIPLINARY AMS TEAM	IV TO PO SWITCH
GUIDELINE DEVELOPMENT	EDUCATION
	ANTIMICROBIAL ORDER FORMS
	ANTIMICROBIAL CYCLING
	COMBINATION ANTIMICROBIAL THERAPY
	INFORMATION TECHNOLOGY TO PROVIDE DECISION SUPPORT AND ENHANCED SURVEILLANCE
	ANTIBIOGRAMS - AT PATIENT AND ORGANISATION LEVEL

http://bsac.org.uk/antimicrobial-stewardship-from-principles-to-practice-e-book/

MARK GILCHRIST & ORLA GEOGHEGAN

ANTIMICROBIAL STEWARDSHIP From Principles to Practice

Systematic review & Meta-analysis: Impact of key technical interventions

- **Adherence to local guidelines**
  - **Mortality: RRR 35% [RR 0.65, 95% CI 0.54–0.8; P<0.0001]**
- **Culture driven de-escalation**
  - **Mortality: RRR 65% [RR 0.44, 95% CI 0.3–0.66; P<0.0001]**
- ***S.aureus* bacteraemia clinical review**
  - **Mortality: RRR 66% [RR 0.34, 95% CI 0.25–075; P<0.008]**
- **IVOST No difference in mortality? Reduced LOS**
- Restriction of antibiotics decreased consumption and in many studies resistance to the drug-bug profile
- TDM decreased nephrotoxicity

CI, confidence interval; IVOST, intravenous to oral switch therapy; LOS, length of stay; RR, relative risk; RRR, relative risk reduction; TDM, therapeutic drug monitoring Schuts EC, et al. Lancet Infect Dis. 2016 Mar 2. pii: S1473-3099(16)00065-7.

FRONT END (HOSPITAL)

- Antimicrobial policy "rule book"
- Formulary and restriction
- Guidelines or pathways for treatment and prophylaxis
- Protects broad-spectrum antimicrobials

BACK END (WARD BASED)

- Antimicrobial review: commonly indication, IVOS, TDM, allergy, C&S results, ADRs. Less commonly: bacteraemia, specific AB, dose optimization.
- Audit and direct feedback to prescribers
- AMS team review when told.

Which one is better, for how long and
for what outcome ?

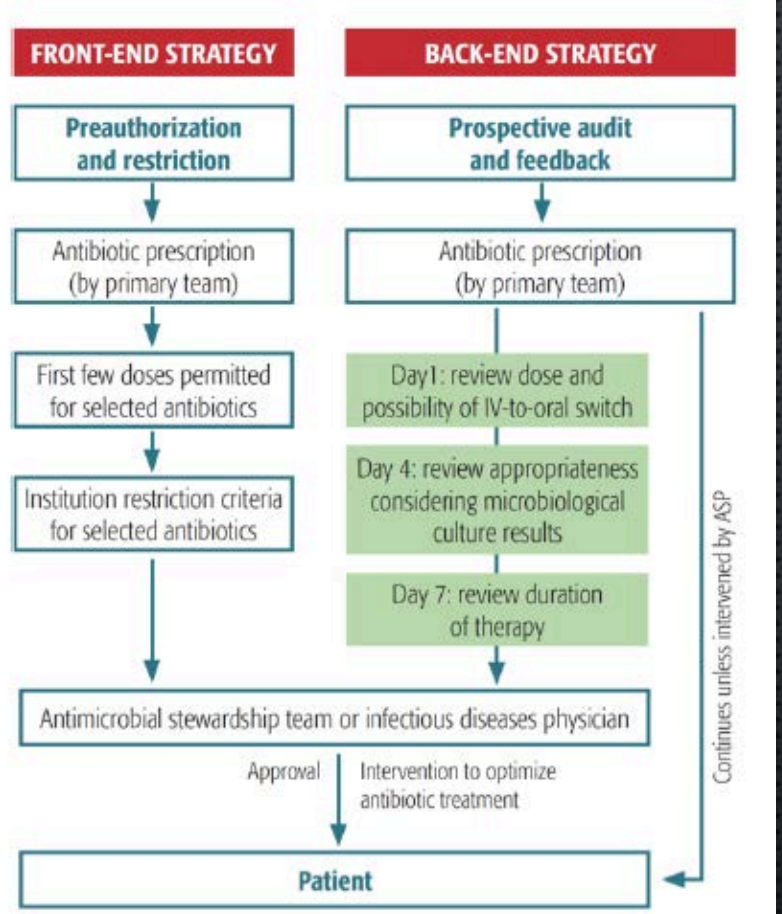
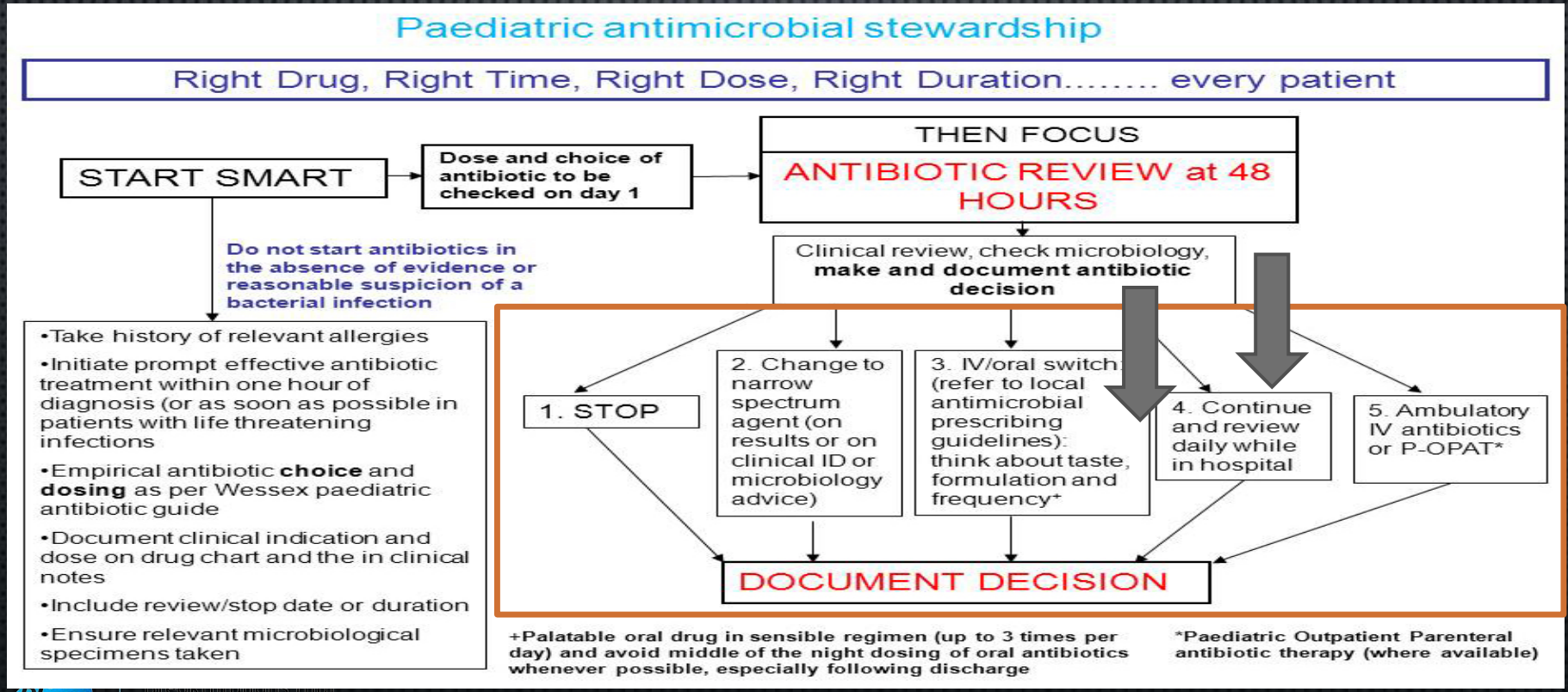


FIGURE 9
How pre-authorisation of restricted antimicrobial agents and prospective audit and feedback can be used as part of an ASP(3). Figure adapted from Chung GW et al. Virulence 2013;4(2):151–157

START SMART, THEN FOCUS



ASHIRU-OREDOPE D, *ET AL. J ANTIMICROB CHEMOTHER*. 2012;67 SUPPL1:I51-63.

What Is the More Effective Antibiotic Stewardship Intervention: Preprescription Authorization or Postprescription Review With Feedback?

Clinical Infectious Diseases® 2017;64(5):537–43

Pranita D. Tamma,[1] Edina Avdic,[2] John F. Keenan,[3] Yuan Zhao,[4] Gobind Anand,[5] James Cooper,[6] Rebecca Dezube,[7] Steven Hsu,[8] and Sara E. Cosgrove[9]

Results. There were 2686 and 2693 patients admitted to the PPA and PPRF groups, with 29% and 27% of patients prescribed antibiotics, respectively. Initially, antibiotic DOTs remained relatively unchanged in the PPA arm. When changed to the PPRF arm, antibiotic use decreased (−2.45 DOT per 1000 patient-days [PD]). In the initial PPRF arm, antibiotic use decreased (slope of −5.73 DOT per 1000 PD) but remained constant when changed to the PPA arm. Median patient DOTs in the PPA and PPRF arms were 8 and 6 DOT per 1000 PD, respectively ($P = .03$). Antibiotic therapy was guideline-noncompliant in 34% and 41% of patients on days 1 and 3 in the PPA group ($P < .01$) and in 57% and 36% of patients on days 1 and 3 in the PPRF group ($P = .03$).

Conclusions. PPRF may have more of an impact on decreasing antibiotic DOTs compared with PPA. This information may be useful for institutions without sufficient resources to incorporate both stewardship approaches.

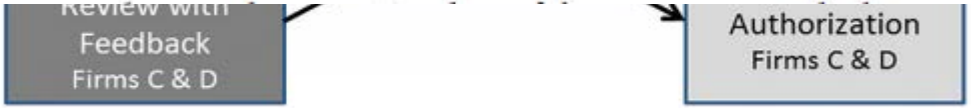


Figure 2. Study design comparing antibiotic use among providers receiving preprescription authorization vs postprescription review with feedback antibiotic stewardship strategies.

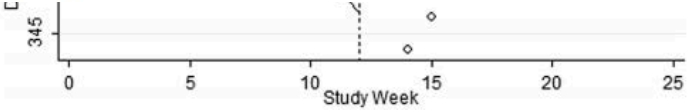


Figure 3. Time-series analyses comparing days of antibiotic therapy per 1000 patient-days during the study period. Dotted lines indicate preprescription authorization and solid lines indicate postprescription review with feedback. Dotted vertical line represents the four week washout period, during which antibiotics were not adjudicated.

BUT DO WE ACTUALLY KNOW HOW BEST TO IMPROVE ANTIBIOTIC PRESCRIBING IN CHILDREN – HEARTS AND MINDS VERSUS POLICING?

Prospective audit with intervention and feedback

(review and provide feedback on antimicrobials after they are started, according to clinical and microbiological data)

and/or

Formulary restriction and preauthorisation

(review and authorise antimicrobials before treatment)

Handshake stewardship[1]

(1) lack of restriction and preauthorisation
(2) review of all prescribed antimicrobials
(3) a rounding-based, in-person approach to feedback by a pharmacist–physician team

Results

Overall antimicrobial use decreased by 10.9%
Vancomycin use decreased by 25.7% (105 to 78 DOT/1000 BD) Meropenem use decreased by 22.2% (45 to 35 DOT/1000 BD) without a compensatory increase of other antipseudomonal agents.

1. HURST AL, *ET AL. PEDIATR INFECT DIS J.* 2016;35(10):1104-10

Feasibility of Core Antimicrobial Stewardship Interventions in Community Hospitals

JAMA Network Open. 2019;2(8):e199369. doi:10.1001/jamanetworkopen.2019.9369

INTERVENTIONS Two antimicrobial stewardship strategies targeted vancomycin hydrochloride, piperacillin-tazobactam, and the antipseudomonal carbapenems on formulary at the study hospitals: (1) modified preauthorization (PA), in which the prescriber had to receive pharmacist approval for continued use of the antibiotic after the first dose, and (2) postprescription audit and review (PPR), in which the pharmacist would engage the prescriber about antibiotic appropriateness after 72 hours of therapy. Two hospitals performed modified PA for 6 months, then PPR for 6 months after a 1-month washout. The other 2 hospitals performed the reverse.

The median time dedicated to the stewardship interventions varied by hospital (range of median hours per week, 5-19). Overall antibiotic use decreased during PPR compared with historical controls (mean [SD] days of therapy per 1000 patient-days, 925.2 [109.8] vs 965.3 [109.4]; mean difference, −40.1; 95% CI, −71.7 to −8.6), but not during modified PA (mean [SD] days of therapy per 1000 patient-days, 931.0 [102.0] vs 926.6 [89.7]; mean difference, 4.4; 95% CI, −55.8 to 64.7).

CONCLUSIONS AND RELEVANCE Strict PA was not feasible in the study hospitals. In contrast, PPR was a feasible and effective strategy for antimicrobial stewardship in settings with limited resources and expertise.

HOW TO START A HOSPITAL ANTIMICROBIAL STEWARDSHIP PROGRAMME: H-ASP

IMPLEMENTATION AND MONITORING PHASE MONTH 4-6

30% MONITORING, ANALYSING AND REPORTING

- ***Prepare plan for measurement, analysis, feedback, visualisation and communication***
- ***Agree potential targets and actions***

-Seek resources to do this

60% IMPLEMENTATION

- Continue to implement, evaluate, adjust all actions previously
- Present AMS action plan to AMS committee including business case, resourcing etc
- Present plan to hospital management- outline realistic clinical, quality, safety and potential economic benefits – do not overpromise benefits and outline timelines for these
- Ensure you have enough friends /supporters at hospital management level
- Present data to prescribers, clinical staff and reports to hospital management
- Communicate and celebrate successes and learn from failures
- At all times be prepared to adjust and do not take your eye of the ball !

How to start an antimicrobial stewardship programme in a hospital

M. Mendelson, Clin Microbiol Infect 2019;■:1

WHO TOOLKIT: MEASURING ANTIMICROBIAL

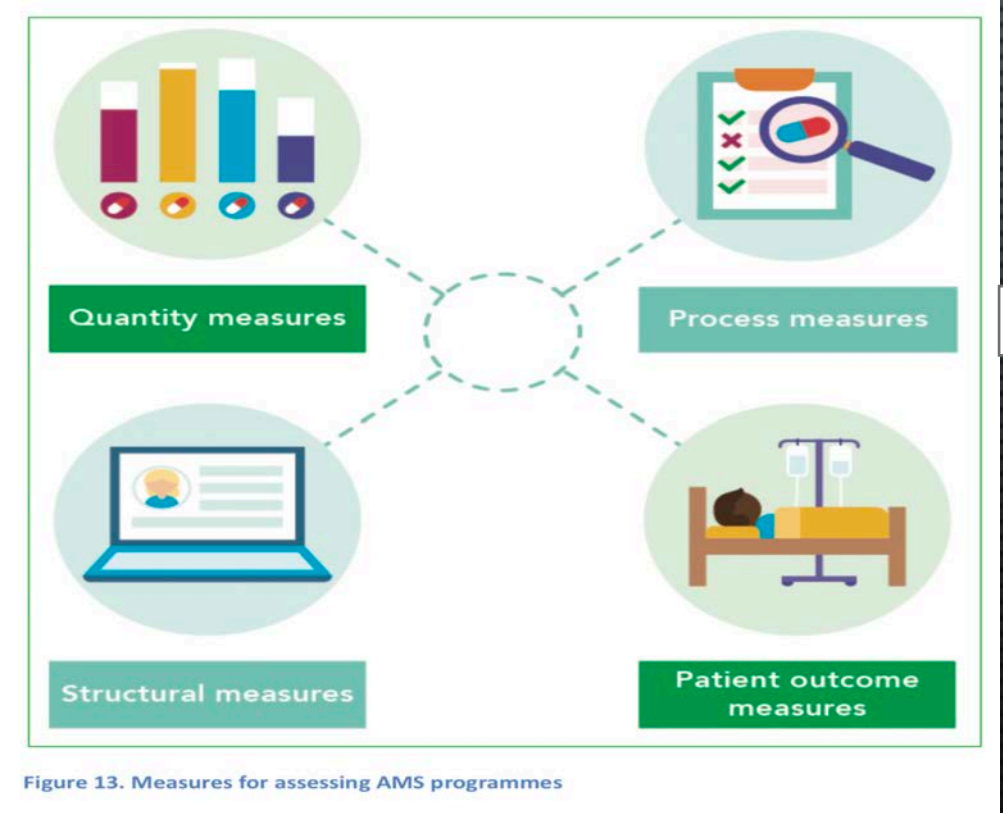


Figure 13. Measures for assessing AMS programmes

Quality of Antimicrobial Prescribing

AMS METRICS SUMMARY

STRUCTURAL INDICATORS

- Availability of **multi-disciplinary antimicrobial stewardship team**
- Availability of **guidelines** for empiric treatment and surgical prophylaxis
- Provision of education in the last 2 years

PROCESS MEASURES

- **Amount of antibiotic** in DDD/100 bed days
  - Promoted antibiotics
  - Restricted antibiotics
- **Compliance with acute empiric guidance** (documented notes and policy compliance)
- % appropriate **de-escalation**; % appropriate switch from **IV to oral**
- Compliance with **surgical prophylaxis** (<60 min from incision, <24 hours and compliance with local policy
- Compliance with **care "bundles"** – all or nothing (3-day antibiotic review bundle, ventilator-associated pneumonia, community-acquired pneumonia, sepsis)

OUTCOME MEASURES

- *C. difficile* infection rates
- Surgical Site Infection (SSI) rates
- Surveillance of resistance
- Mortality: Standardized Mortality Rates (SMRs)

BALANCING MEASURES

- Mortality
- SSI rates
- Readmission within 30 days of discharge
- Admission to ICU
- Rate of complications
- Treatment-related toxicity (e.g. aminoglycoside-related toxicity)

OUTCOME MEASURES	REMARKS
CLINICAL	
Mortality	Important, but less suitable for mild infections (e.g. uncomplicated UTI)
Length of Stay	General or ward-specific (e.g. ICU stay); easy to obtain, but highly sensitive to biases
Complications	Eg: IV catheter-related problems and phlebitis
Clostridium difficile	Indirect measure for antimicrobial use
Readmission rates	Due to relapse. Also consider effect of neighboring institutions
Toxicity (systemic)	Most frequently in renal function and liver
MICROBIOLOGICAL	
Resistance levels	Difficult to measure due to generally long time frame (months to years)
ANTIMICROBIAL CONSUMPTION	
Total use	Often measured in DDDs
IV/PO ratio	Of interest with an active IV-to-PO switch program
Broad/narrow ratio	Potentially relevant with regard to resistance development
FINANCIAL	**Preferably done as cost-effectiveness study**

UTI: urinary tract infection; ICU: intensive care unit; PO: per os; LOS: Length of stay; DDDs: defined daily doses; IV: intravenous.

http://bsac-jac-amr.com/wp-content/uploads/2019/04/Biomer-2019-ANTIMICROBIAL-STEWARDSHIP-BOOKLET-FINAL2.pdf

COMMUNICATION METHODS: USING DATA EFFECTIVELY

The Stewardship Audience

Perceived Most Important by Position

Outcome	Hospital Administrator	Pharmacy Director	P&T Committee	ID Physician
Antibiotic Use	1 (2)	9 (22)	13 (32)	1 (2)
Antibiotic Cost	17 (42)	23 (56)	6 (15)	0 (0)
Appropriateness	2 (5)	2 (5)	6 (15)	11 (27)
Infection-related mortality	1 (2)	2 (5)	1 (2)	15 (37)
Infection or antibiotic-related length of stay	2 (5)	0 (0)	1 (2)	3 (7)

Bumpass JB et al. *Clin Infect Dis* 2014;59(S3):S108-11

Utilizing Data

1. Define your goal for communicating
2. Determine your target audience
3. Choose the communication method(s)
4. Adopt good communication principles
5. Communicate numbers effectively
6. Provide a take home message

- Measure the impact of your stewardship program
- Choose structure, process and outcome measures
- Feasibility should be a main consideration
- Regularly assess and validate your data
- Communicate your findings, tailor your message
- Consider different approaches for displaying antibiotic use data

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- Present data to prescribers, clinical staff and reports to hospital management
- Communicate and celebrate successes and learn from failures
- ***Scale and sustain***
- At all times be prepared to adjust and do not take your eye of the ball !

How to start an antimicrobial stewardship programme in a hospital
M. Mendelson, Clin Microbiol Infect 2019;■:1

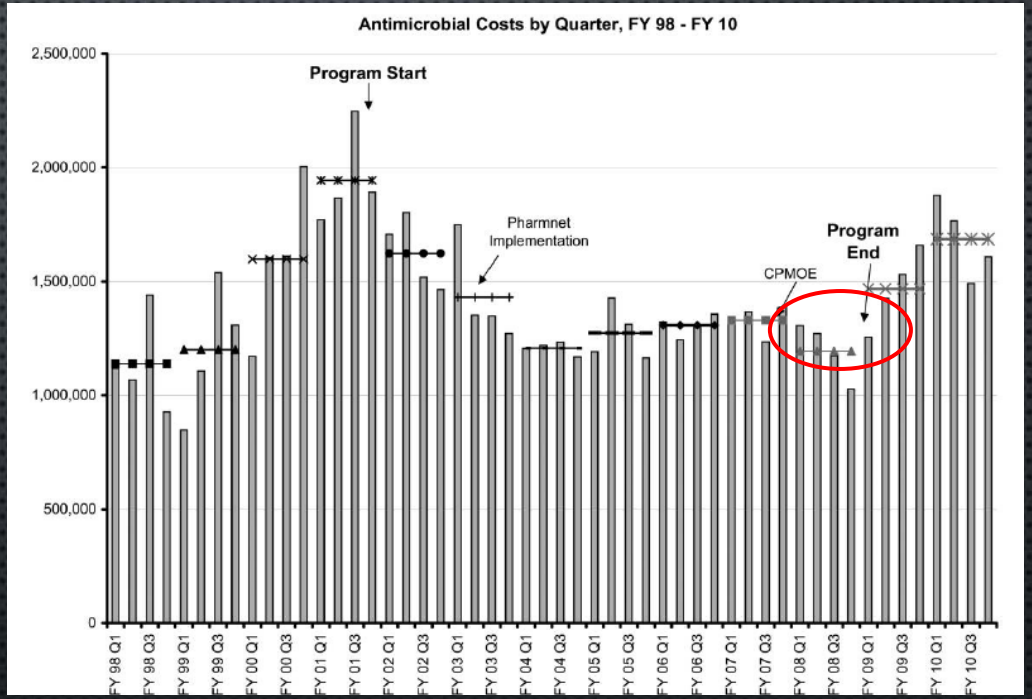
AN IMPORTANT LESSON

INFECTION CONTROL AND HOSPITAL EPIDEMIOLOGY APRIL 2012, VOL. 33, NO. 4

ORIGINAL ARTICLE

Antimicrobial Stewardship at a Large Tertiary Care Academic Medical Center: Cost Analysis Before, During, and After a 7-Year Program

SUSTAINABLE IMPACT OF AMS PROGRAMMES



- We need to teach prescribers to make changes without constant prompting from the stewardship team
- We cannot be in all places at all times

Standiford HC et al. Infect Control Hosp Epidemiol. 2012; 33:338.

SUSTAINABILITY CHALLENGES TO AMS INTERVENTIONS

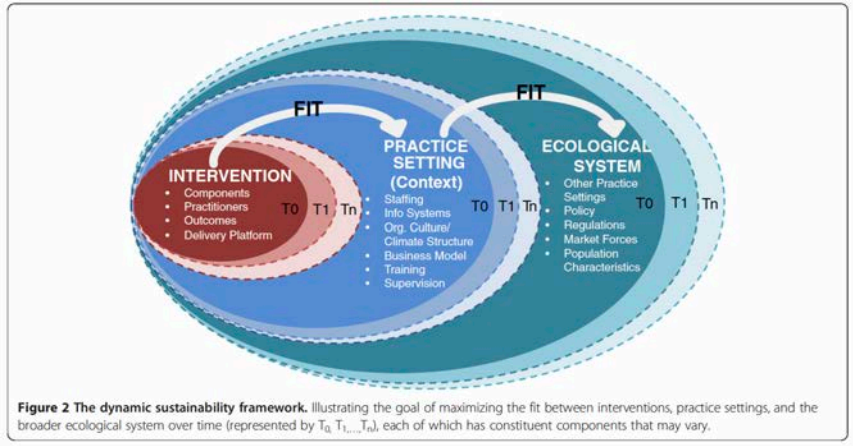


Figure 2 The dynamic sustainability framework. Illustrating the goal of maximizing the fit between interventions, practice settings, and the broader ecological system over time (represented by T_0, T_1,...T_n), each of which has constituent components that may vary.

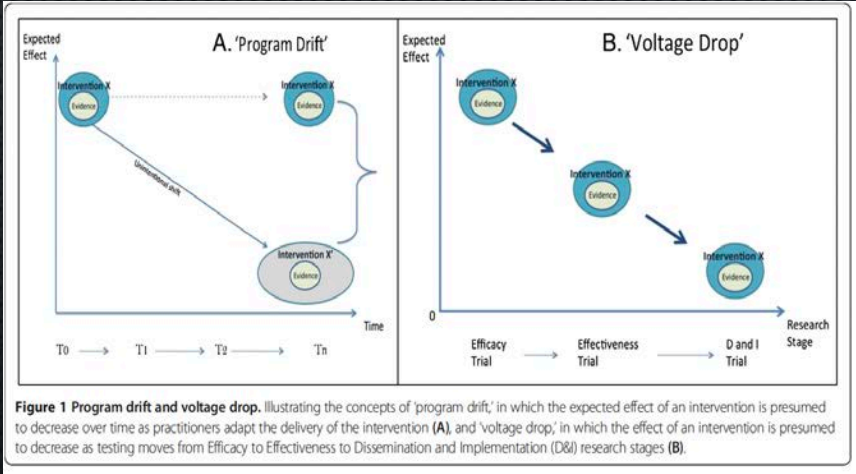


Figure 1 Program drift and voltage drop. Illustrating the concepts of 'program drift,' in which the expected effect of an intervention is presumed to decrease over time as practitioners adapt the delivery of the intervention **(A)**, and 'voltage drop,' in which the effect of an intervention is presumed to decrease as testing moves from Efficacy to Effectiveness to Dissemination and Implementation (D&I) research stages **(B)**.

Term	Definition
Implementation	The process of putting to use or integrating evidence-based interventions within a setting [9].
Sustainability	To what extent an evidence-based intervention can deliver its intended benefits over an extended period of time after external support from the donor agency is terminated [9].
Sustainment	The continued use of an intervention within practice [10].
Voltage drop	The phenomenon in which interventions are expected to yield lower benefits as they move from efficacy to effectiveness and into real world use (adapted from [11]).
Program drift	The phenomenon whereby deviation from manualized protocols in real-world delivery of interventions is expected to yield decreasing benefit for patients (adapted from [12]).

Chambers *et al. Implementation Science* 2013, **8**:117
http://www.implementationscience.com/content/8/1/117

TEN KEY FACTORS

Spread is 'when best practice is disseminated consistently and reliably across a whole system and involves the implementation of proven interventions in each applicable care setting[4]'.

Sustainability is 'when new ways of working and improved outcomes become the norm.' In other words, it is when an improvement has become an integrated and the mainstream way of working. It should withstand challenge and variation over time, through a process of continuous improvement[3].

KEY TIPS FOR SUCCESSFUL AMS PROGRAMMES

The Joint Commission Journal on Quality and Patient Safety xxxx; xxx:xxx–xxx

CONFERENCE REPORT

Leading Practices in Antimicrobial Stewardship: Conference Summary

Table 1. Suggested Antimicrobial Stewardship Interventions from the Leading Practices in Antimicrobial Stewardship Conference*

Key Suggested Interventions	Other Suggested Interventions
Implement disease state guidelines.	Ensure strong leadership and adequate financial support.
Engage frontline clinicians.	Engage local medical communities and academic partners.
Address inappropriate diagnostic testing.	Determine whether patients labeled as having a beta-lactam allergy are truly allergic.
	Establish standard processes and procedures to evaluate antimicrobials at transitions of care.

Table 2. Suggested Measures for Antimicrobial Stewardship Programs from the Leading Practices in Antimicrobial Stewardship Conference

Key Suggested Measures	Other Suggested Measures
Days of therapy per 1,000 days present or patient-days	Prescribing patterns of individual clinicians
Hospital-onset *C. difficile* rates	Total duration of antibiotic therapy
Appropriate use and concordance of care with clinical practice guidelines	

Facilitators and barriers to implementing antimicrobial stewardship strategies: Results from a qualitative study

A.L. Pakyz et al. / American Journal of Infection Control 42 (2014) S257-S263

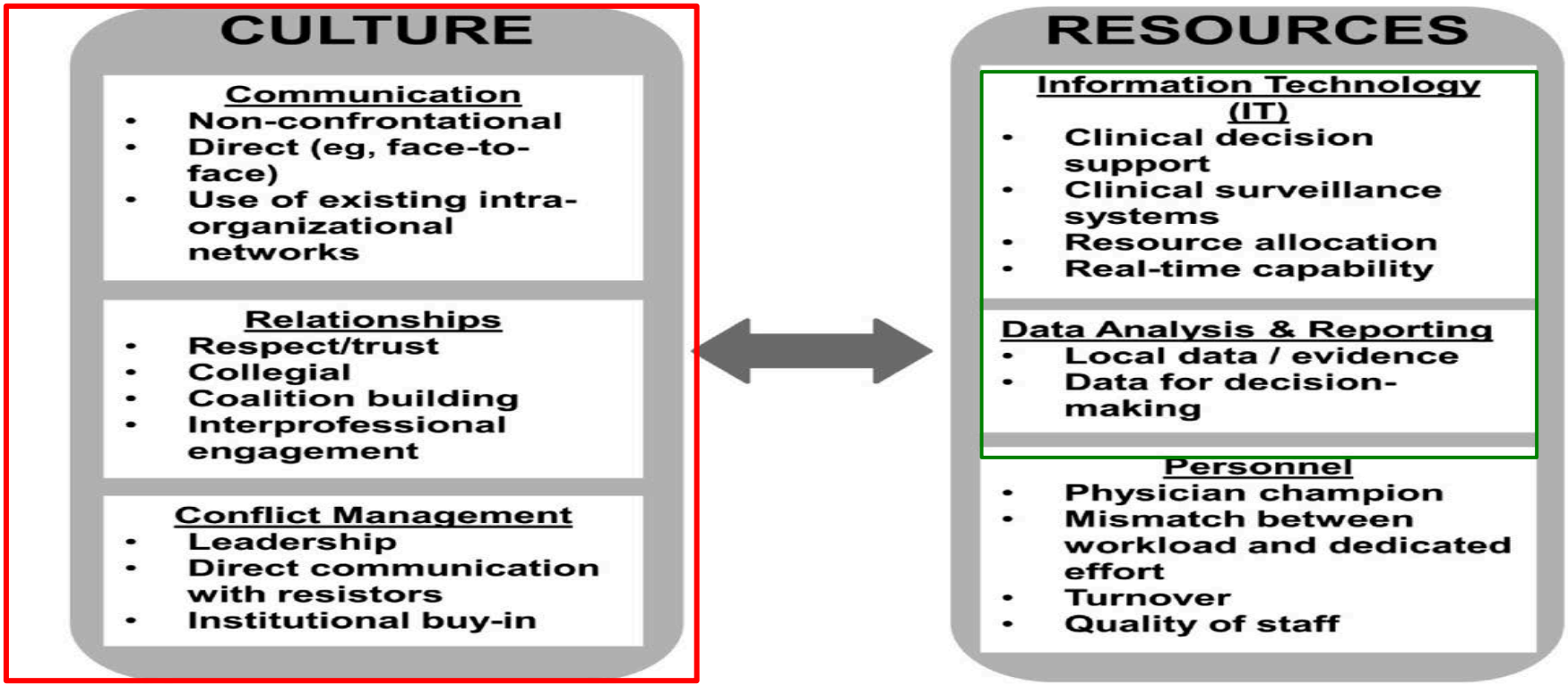
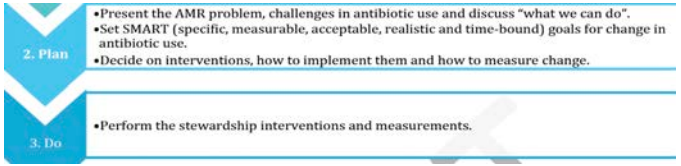


Fig 1. Factors related to implementation of antimicrobial stewardship program strategies.

D DO

Impact of an antimicrobial stewardship programme on antibiotic usage and resistance in a tertiary hospital in China

Z.-g. Zhang MSc[1] | F. Chen MSc[1] | Y. Ou MSc[2]



Q: Classify the interventions in this paper into structural, enabling, persuasive or restrictive?

Plan: Evaluate the impact of an AMS programme is a tertiary hospital in China
Do: AMS Interventions agreed and implemented : Structural [S] + Process [P] + agreed measures [0]

- Strengthening access to guidelines (web based and up to date guidelines)
- Restricted use of antibiotics only prescribed by those authorised to do so
- Forbid antibiotic treatment for > 14 days & surgical prophylaxis for > 2days
- New order sets for > 14 days & surgical prophylaxis for > 2d
- Just in time" computer automated advice
- Selective ID –pharmacy review

J Clin Pharm Ther. 2017;42:579–584.

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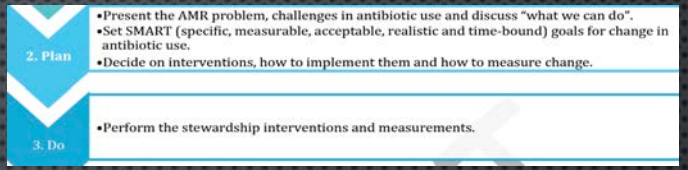


A: Classify the interventions in this paper into structural, enabling, persuasive or restrictive?

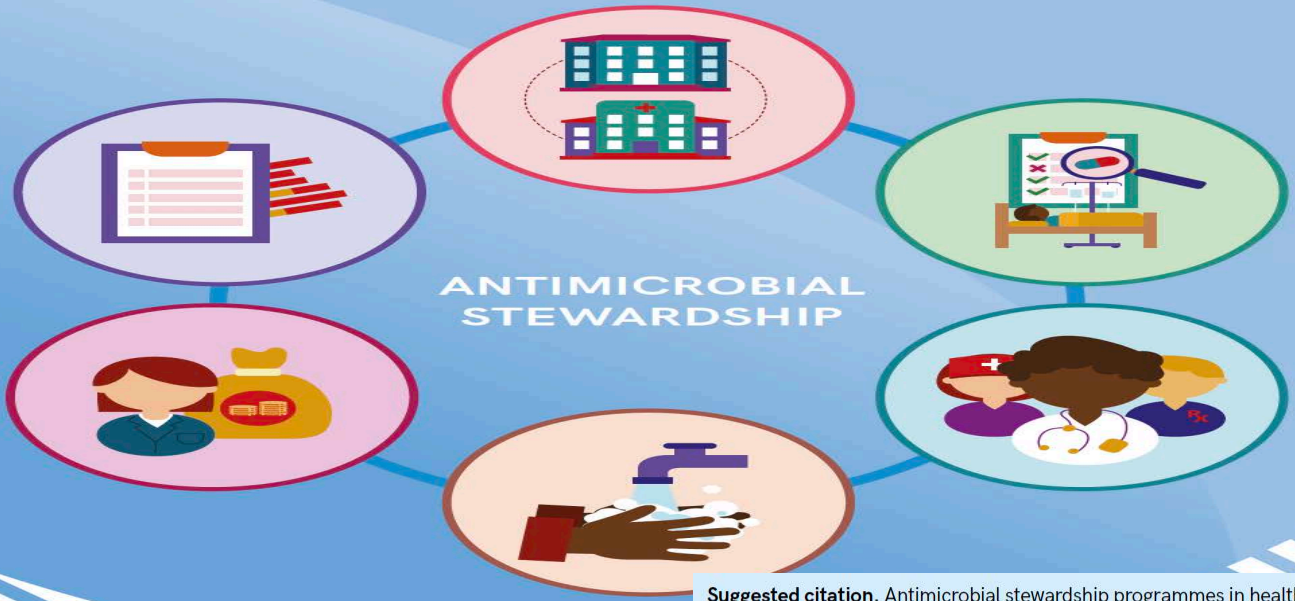
- Strengthening access to guidelines (web based and up to date guidelines) Structural & Enabling
- Restricted use of antibiotics only prescribed by those authorised to do so Restrictive
- Forbid antibiotic treatment for > 14 days & surgical prophylaxis for > 2days Restrictive
- New order sets for > 14 days & surgical prophylaxis for > 2d Structural
- Just in time" computer automated advice Enabling
- Selective ID –pharmacy review Enabling & persuasive

J Clin Pharm Ther. 2017;42:579–584.

World Health Organization

ANTIMICROBIAL STEWARDSHIP PROGRAMMES IN HEALTH-CARE FACILITIES IN LOW- AND MIDDLE-INCOME COUNTRIES

A WHO PRACTICAL TOOLKIT



Suggested citation. Antimicrobial stewardship programmes in health-care facilities in low- and middle-income countries. A practical toolkit. Geneva: World Health Organization; 2019.
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