



Joint Action  
Antimicrobial Resistance and  
Healthcare-Associated Infections

## Deliverable 7.2

### Report on the Workshop on Implementation of antimicrobial stewardship

WP7 | Appropriate use of antimicrobials in human and animals

Leader acronym | FHI & AEMPS

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Dissemination level | Public

Delivery date | 28-2-2019



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## List of Acronyms

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<b>AMR</b>	Antimicrobial Resistance
<b>ABS</b>	Antimicrobial Stewardship
<b>AEMPS</b>	Spanish Agency of Medicines and Medical Devices
<b>ECDC</b>	<b>European Centre for Disease Prevention and Control</b>
<b>EU</b>	European Union
<b>EU-JAMRAI</b>	European Union Joint Action on Antimicrobial Resistance and Healthcare -Associated Infections
<b>FHI</b>	Norwegian Institute of Public Health
<b>GP</b>	General Practice
<b>HCAI</b>	Healthcare-Associated Infections
<b>IT</b>	Information Technology
<b>JA</b>	Joint Action
<b>LTCFs</b>	Long Term Care Facilities
<b>WHO</b>	World Health Organization
<b>WP</b>	Work Package

## Represented Countries in the Workshop

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Country	Country	Country
Spain	Netherlands	Sweden
Norway	Bulgaria	Denmark
France	Germany	Poland
Ireland	Italy	Portugal
Polska	Czech Republic	Croacia
Belgium	Romania	Switzerland
Austria	Luxembourg	United Kingdom
Lithuania	Greece	

## Background to the meeting

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The EU Joint Action on AMR and HAI is divided up into nine work packages including both administrative and functional tasks. Work package 7 concerns the appropriate use of antimicrobials in humans and animals and has four main tasks:

- Task 7.1 - Development and publication of a resource bank of materials and a summary of the situation in Europe. This includes both a compilation of available materials and a survey on knowledge and attitudes to implementation at national, hospital, nursing home and GP levels for humans and materials for animal practice too.
- Task 7.2 - A workshop with invited experts to discuss the results of the survey, share experience and identify common factors in implementation of stewardship programmes.
- Task 7.3 - Qualitative evaluation of implementation at different levels of healthcare and in different country settings. Structures questions designed to be combined with earlier results to finalise a list of core-components crucial for practical implementation of stewardship for human medicine.
- Task 7.4 - Near real-time surveillance of AMR and antimicrobial consumption in humans and animals.

Due to a lack of participants, we had to cancel the workshop on stewardship in animal health and the rest of this report relate only to the meeting about human medicine.

The workshop was organised and led by AEMPS from Spain and FHI from Norway. The meeting was hosted and all the facilities were provided by the Federal Ministry of labour, Social Affairs, Health and Consumer Protection. There were four facilitators: Antonio Lopez, Live Storehagen Dansie, Laura Alonso Irujo and Oliver Kacelnik. The Joint Action invited Dilip Nathwani (Consultant and Professor in infectious diseases at Ninewells Hospital Medical School in Dundee, previously chairman of the National Antimicrobial Prescribing Group and advisor to the WHO on antibiotic stewardship) as expert speaker and rapporteur for the meeting.

All partners and stakeholders who were able to contribute to the discussions were invited to participate. In total 46 people attended representing many different countries and all the different levels of health care.

The workshop began with a presentation by Oliver Kacelnik to set the scene. Then Dilip Nathwani held a seminar on antibiotic stewardship. After this, the participants were divided into groups for discussion, first on ASP in the community and then about hospitals. Towards the end of the meeting the groups reported back on their discussions and then the facilitators and expert compiled a summary of the discussions which was presented back to the group for further reflection.

## Questions sent prior to the meeting

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Prior to the workshop all attendees received a set of questions as a primer to the discussions. All questions were about ABS in hospitals and primary care including long-term care facilities

- What is in place at national and local levels?
- What have the success stories been?
- What have been the barriers for the implementation?
- What strategies have you used for dissemination and acceptance?
- How have you involved stakeholders such as doctors, pharmacists and nurses?

## Aims of the Workshop

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The objectives of the workshop were:

- To discuss the findings of the JA survey on ABS implementation
- Identify success factors in different settings
- Identify barriers to implementation
- Compile a report from the meeting to guide further interviews
- Aid implementation of effective stewardship in Europe at all levels of health care

## Preliminary results from the survey

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The first session of the workshop was concerned with presenting the preliminary results from the survey. The findings are summarized below. The survey was developed with help from the European Centre for Disease Control. It was launched on May 14th 2018 and sent to all partners and national focal points for antibiotic consumption and AMR. All recipients were asked to forward the survey to others that could provide useful answers. In total there were 95 respondents from 28 different countries. Six countries provided more than four answers each. Italy and Spain were the highest respondents. Of those who answered, 46 had read the EU guidelines for the prudent use of antimicrobials in human health and 28 reported that they actively used them.

Over 80% of respondents reported that antibiotic stewardship programmes were active in hospitals in their country. This dropped to under 40% for primary care in

the community and just over 20% for LTCFs. In most countries it was doctors and scientific societies that were involved in the development of ASPs. Only four reported earmarked funding for the development of ASPs in primary care (including LTCFs) and four (not identical) had earmarked funding for implementation. Six countries reported the availability of a toolkit for implementation in primary care. Of those that had ASP in GP settings all had a specific communication strategy.

According to the survey results on hospitals, five countries had earmarked funding for development and implementation of ASP. 13 countries had a communication strategy and toolkit, while 19 reported the existence of indicators for the effect of ASP. In ten countries audits of prescribing practice were routine. In most countries it was the national authorities that were responsible for ASP in hospitals. 45% answered that doctors were consulted and about 30% said that pharmacists were involved. Only 15% reported the involvement of nurses.

## **Implementation of stewardship in the community**

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Through the sharing of experiences and open discussion the groups identified factors that were crucial for success and those that were a hinderance for the implementation of ASPs.

Below an example of the conclusions of an open discussion between representatives from Austria and Spain:

### **Spain:**

- In Spain emergency rooms belong to primary care (???) but not in Austria
- There are plans and strategies but not funding to implement them
- They developed guidelines but unfortunately some specialities decided not to use them even if the stewardship program was adapted for different specialities.

### **Austria:**

- It is very difficult to control the primary care private practice.
- In Austria you can treat your patient as you want.
- Health authorities can know that ATBs were prescribed but not why they were prescribed.

### **Success factors**

Leadership was the key to implementation both in terms of clinical leads and central institutional support. This includes access to hospital expertise (microbiologists) and good communication across primary care, LTCFs and inter-

professional groups. We also identified education and especially “peer to peer” programmes as important building blocks. Good infrastructure was also a key success factor. Our experts described good experience with uniform cross-system guidelines and software. Access to good quality data on resistance and electronic alert systems were also discussed. One other factor was public engagement through public slogans and campaigns. Lastly, it was felt that incentives for good practice must be in place and that indicators should be linked to these incentives.

### **Barriers for the implementation**

In several countries of the EU it was felt that the tension between public and private sectors involvement and their links to incentives were a significant problem to the implementation of ASPs. This included the problem of over the counter antibiotics and the expectations of patients.

In contrast to the success factors discussed above, poor sharing of information and data was identified by many as a significant barrier. Furthermore, the existence of guidelines with no legal weight was not useful to change behaviour. The lack of electronic prescribing was also a problem.

The challenges of diagnostic uncertainty due to a lack of bedside diagnostics and rapid access to results can lead to overuse of antibiotics. Establishing ASP in LTCFs was also hindered by the many different doctors that are often involved and that their management varies between establishments. In some countries the lack of involvement of nurses and community pharmacists was raised as another barrier.

Lastly, all the groups mentioned the problem of motivating healthcare professionals to consider that the wider implications of their antibiotic prescribing were a problem. The difficulty of successfully establishing behavioural change was something that was named as a problem. This is made worse by a lack of education of medicine students about antibiotic stewardship, antimicrobial resistance in general and healthcare-associated infections.

## **Implementation of stewardship in hospitals**

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Many of the same factors that were discussed in primary care and LTCFs were also brought up in the discussions surrounding practice in hospitals. However, some important differences were also highlighted.

### **Success factors**

As with implementation in primary care leadership was identified as the key factor for successful implementation in hospitals. Specifically, that the person responsible for ASPs in the hospital must be a leader in a position of authority with a

reputation known throughout the hospital. This person is then able to lead a team that will foster a broad clinical engagement within the institution.

Success factors in terms of infrastructure were again brought up. Good IT and connectivity support is essential. As is good laboratory support from microbiologists to clinicians and clinically meaningful epidemiology data. The setting of both short and long term goals was important as well as tying ASP to hospital accreditation. Other structural factors that were discussed were the integration of the AMS team and the IPCT teams, giving pharmacists a role in reviewing prescribing, regular audits with feedback, local guidelines and training. Furthermore, several people discussed the benefits of joining EU mentor programmes.

### **Barriers to implementation**

In contrast to the factors needed for success, an important barrier to successfully implement ABS in hospitals is a lack of prioritization by leaders. One way that this manifests itself is by the lack of accountability to target attainment. This can be exacerbated by a lack of dedicated resources for audits and feedback.

Another factor that was raised was that the way hospital care is organized is not always conducive to good stewardship. For example, a lack of continuity of care and changing staff, fatigue and lack of time and money are significant problems.

Some barriers for the implementation were more specific to hospitals in particular settings. Examples of these include seeing the stewardship team as a threat to autonomous clinical practice and best care for the individual patient, the involvement of non-medical professionals and the involvement of different professional societies. More general points include a lack of training and the lack of integration of clinical informatics into the clinical decision making process.

## Conclusions and recommendations

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### General remarks

It is clear that there are not only different cultural influences on prescribing practice and the establishment of stewardship programmes but also structural ones between member states. There are different definitions of what is primary care, different use of LTCFs and different rules on which professional groups are allowed to prescribe antibiotics. Furthermore, some countries had chosen a regional approach to the AMR issue whilst others tackle it at a national level. However, it was also surprising how similar some of the general factors for success and failure were between very different settings.

The participants agreed that their experience generally showed that it was easier to establish stewardship programmes in primary care when the individual units (GPs or LTCTs) were part of a network rather than independent actors. This was probably due to being able to act centrally rather than via individual contracts with different practitioners. In some countries, there was still resistance to adopt guidelines as they were considered a threat to the autonomy of doctors and there was a worry of being classified as a “bad prescriber”

### Conclusions

The meeting was very successful in achieving its aims. It was well attended by people who were able to contribute significantly to the discussions. Our Expert-witness (Dilip Nathwani) was a very appropriate choice and gave both a good talk and summary of all the discussions.

Overall, the impression from the meeting was that hospitals currently have more in place than community settings in their own countries. Whilst there has been a lot of recent action for family doctors experience with LTCFs is lagging behind. Although there were different success factors/problems specific to individual countries there was also a lot of common ground. Generally, it is vital to have good leadership and clear lines of accountability. A well-functioning and integrated IT network was also crucial. Lastly, public awareness and inclusion of different professional groups was also highlighted. In contrast, a lack of incentives, no earmarked funding or budgeting and a lack of place in medical education were all named as barriers to good implementation.

## Future steps

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Participants recommended that in the future further focus should be set on:

- Securing ear-marked funding
- Education at all levels on stewardship
- Incentivising good prescribing practice and peer to peer learning
- Formulary for long term care
- Quarterly feedback to prescribers
- Rapid tests
- Exact quantify dispensing options

The Joint Action will now move on to using the findings from the workshop and survey as a basis for in-depth interviews of people at all level of stewardship chain (from national advisors to GPs and pharmacists) in order to draw up a set of recommendations for more effective implantation of stewardship in different settings throughout the EU.

## Appendix 1: Implementation of antibiotic stewardship programs in Europe (human health)



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# Implementation of antibiotic stewardship programs in Europe (human health)

Primary care, hospitals and long-term facilities

Oliver Kacelnik



## Welcome to Vienna! - Workshop for WP7 EU-JA-AMR



- Thank you for coming!
- Task leaders - AEMPS and FHI (Spain and Norway)
- Facilitators- Antonio Lopez, Live Storehagen Dansie, Laura Alonso Irujo and Oliver Kacelnik
- Invited expert - Dilip Nathwani
  - Consultant and Professor in infectious diseases at Ninewells Hospital Medical School i Dundee, previously chairman of the National Antimicrobial Prescribing Group and advisor to the WHO on antibiotic stewardship

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## Aim of the workshop



- To discuss the findings of the JA survey on ABS implementation
- Identify success factors in different settings
- Identify barriers to implementation
- Compile a report from the meeting to guide further interviews
- Aid implementation of effective stewardship in Europe at all levels of health care

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# Agenda



Time	Agenda Topic / Presenter
12:30 - 13:00	Registration & welcome coffee
13:00 - 13:15	Plenary introduction and presentation of survey results guidelines and tools for appropriate use of antimicrobials in humans. Oliver Kacelnik
13:15 - 13:45	<b><i>Dilip Nathwani</i></b> , <i>Consultant in Infectious Diseases and Honorary Professor of Infection at the University of Dundee, Chair of the Scottish Antimicrobial Prescribing Group, European Study Group on Antibiotic Policies and President of the British Society for Antimicrobial Chemotherapy amongst other positions</i>
13:45 - 14:45	Implementation of AMS in long-term care and primary care facilities. Share experiences and discussion
14:45 - 14:55	10' Break
14:55 - 15:55	Implementation of AMS in hospitals. Share experiences and discussion
15:55 - 16:25	30' Mingling Break (panel will draft preliminary findings)
16:35 - 17:10	Consensus findings, further questions and expert review
20:00	Cocktail dinner



Background and Aims



Methodology and General Results



Primary care including LTCF - Session 1



Hospital care - Session 2



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## WP7 - Appropriate use of antimicrobials in human and animals



- 7.1 - Resource bank of materials and summary of European situation
  - Compilation of materials available for GPs, LTCF and Hospitals
  - Survey on knowledge and attitudes to implementation
- 7.2- Workshop
  - Survey results
  - Discuss implementation models
- 7.3 - Qualitative evaluation of implementation
  - Interviews and compilation of core components
- 7.4 - Near real-time surveillance of AMR and antimicrobial consumption

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## WP7 - Appropriate use of antimicrobials in human and animals



- 7.1 - Resource bank of materials and summary of European situation
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  - Survey on knowledge and attitudes to implementation
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## Knowledge, Knowledge translation and Implementation



- Knowledge - facts, information, and skills acquired through experience or education; the theoretical or practical understanding of a subject.
- Knowledge translation - is the umbrella term for all of the activities involved in moving research from the laboratory, the research journal, and the academic conference into the hands of people and organizations who can put it to practical use.
- Implementation science addresses this gap of how to adopt a new intervention.
- Evidence alone is insufficient for behaviour change and getting new ideas adopted in a healthcare service is often difficult despite being shown to be beneficial.

## Aim



Collect information on the implementation of antibiotic stewardship programs at all 3 levels of healthcare in Europe

1. Primary care
  2. Long-term facilities
  3. Hospitals
- What has been implemented?
  - Under which conditions?
  - What were the outcomes?
  - Knowledge of how these have been implemented?

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A microscopic view of numerous rod-shaped bacteria, likely Bacillus subtilis, against a blue background. The bacteria are shown in various orientations and focus, creating a sense of depth and movement.

# Methodology and General introduction

## Methodology



- Electronic questionnaire (English)
- Four parts: (1) introduction, (2) primary care, (3) LTCF(4) hospitals
- Developed by FHI, AEMPS and ECDC.
- Pilot version shared with partners and stakeholders (ECDC, WHO,EC) for feedback
- Final version distributed on May 14th 2018:
  - Both to National focal points for antibiotic consumption and AMR (via ECDC)
  - WP7 partners (fill in survey if appropriate + forward to relevant facilities)

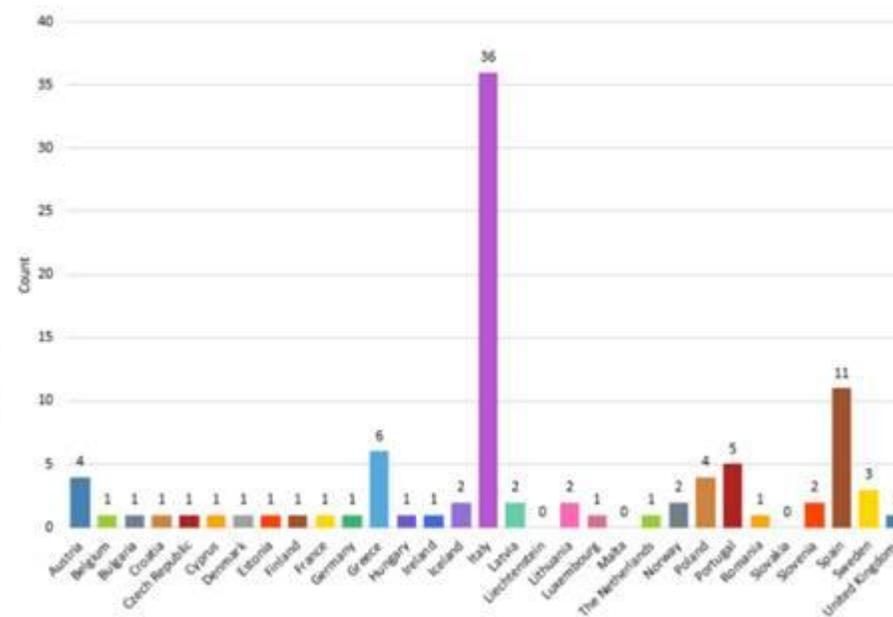
# Results



Total number of respondents:	95
Number of countries:	28
Number of respondents - hospitals	60
Number of respondents - primary care	56
Number of respondents - long-term care	22

Countries with 4 or more respondents:	Austria (4), Poland (4), Portugal (5), Greece (6), Spain (11), Italy (36)
---------------------------------------	---------------------------------------------------------------------------

1. For which country are you answering?



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## Which professions answered?\*



Occupation	Comments
Public health specialists	
Clinical microbiologists	
Pharmacists	Only three respondents
GPs	25/26 from Italy
Researcher/scientists	
Physicians	

\*Based on email addresses and searches

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# EU Guidelines for the prudent use of antimicrobials in human health

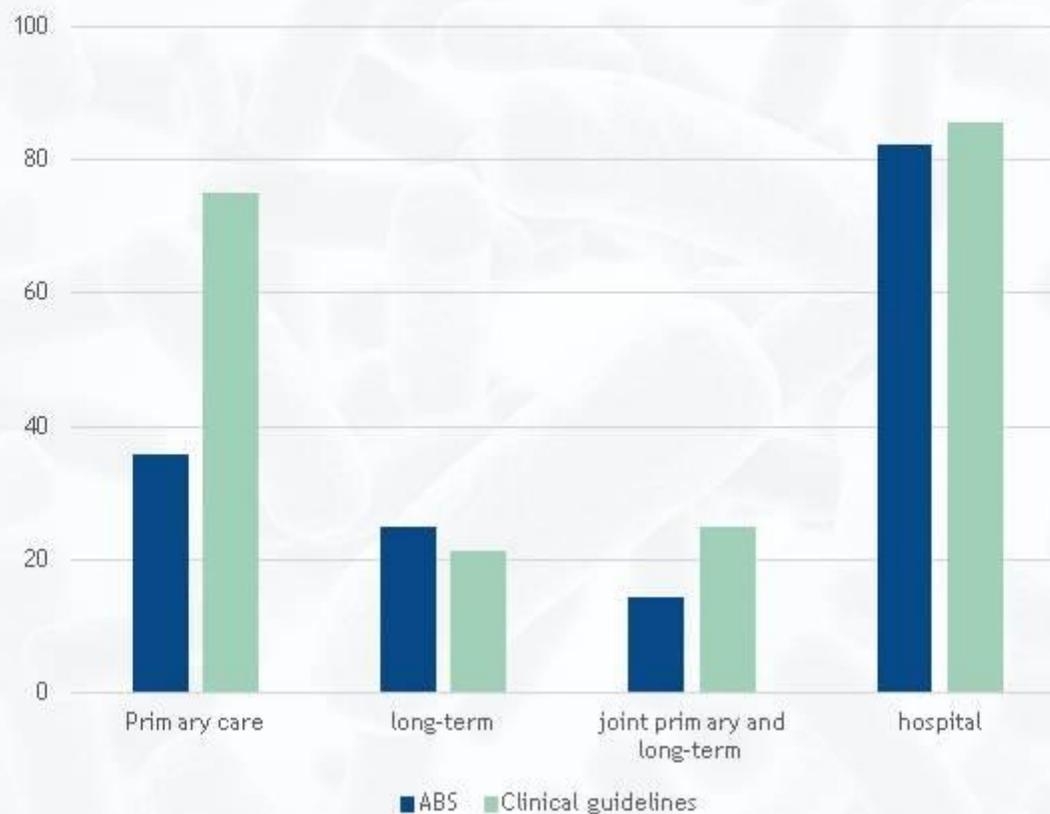


- Of those who answered the survey:

Answer	Number of respondents
I am not aware of the guidelines	4
I am aware of the guidelines, but not yet read them	17
I have read the guidelines	46
I have actively used the guidelines	28

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## Antibiotic stewardship programs and clinical guidelines for antibiotic treatment: Which level of care have these?

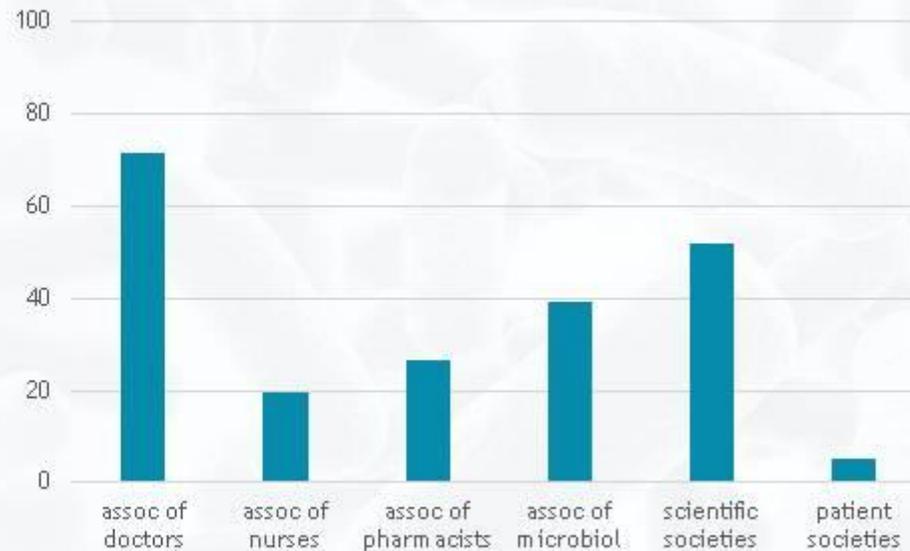


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A microscopic view of numerous rod-shaped bacteria, likely Escherichia coli, against a blue background. The bacteria are shown in various orientations and focus, creating a sense of depth and movement.

# Primary Care including LTCFs - Session 1

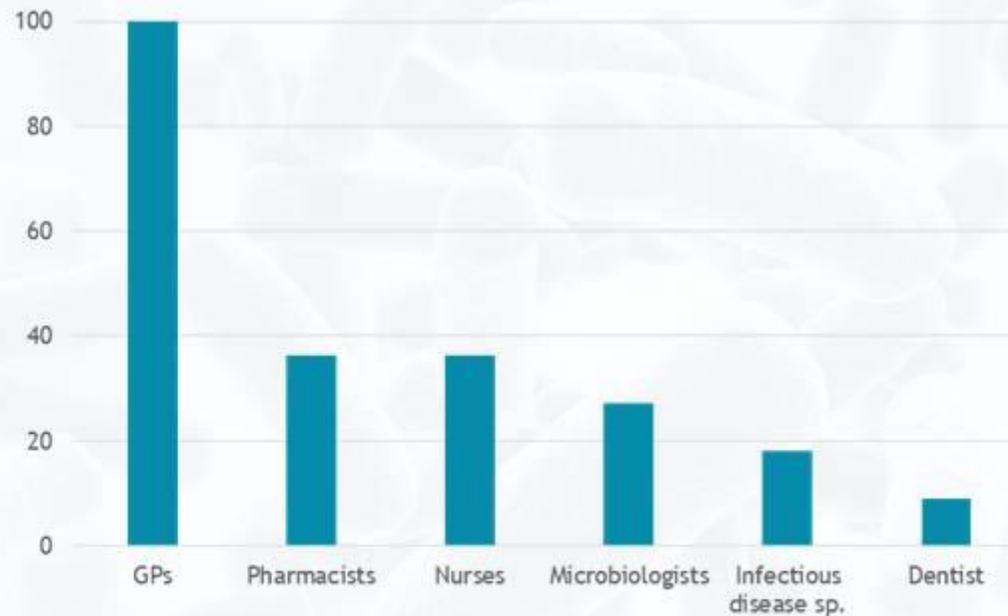
## Who was involved in the development of ASPs?



- Four countries reported earmarked funding for development
- Four had earmarked funding for implementation

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## Who runs ASP in your country? - 11 countries



- All countries that reported ASP in primary care and answered on communication strategy had one
- 6 out of 10 countries reported that there was a toolkit available for implementation

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## Longterm care facilities



- Five out of seven countries answered that they had a communication strategy for LTCF
- Five of eight countries reported a toolkit for implementation in LTCF

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## Possible questions



- What is in place at national and local levels?
- What have the success stories been?
- What have been the barriers to implementation?
- What strategies have you used for dissemination and acceptance?
- How have you involved stakeholders such as doctors, pharmacists and nurses?
- Who do you think the core members of an Antimicrobial Stewardship Team should be for each level of care?

# Groups



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A microscopic view of numerous rod-shaped bacteria, likely E. coli, against a blue background. The bacteria are scattered across the frame, with some in sharp focus and others blurred in the background. The text 'Hospital care - Session 2' is overlaid in white, centered horizontally and slightly above the vertical center.

## Hospital care - Session 2

## ASP in European hospitals



Do/did you have...	Yes	Total
Earmarked funds for development	5	23
Earmarked funds for implementation	5	23
A toolkit available	13*	23
A communication strategy	13*	23
Indicators for effect of ASP	19*	23
Routine audits of antibiotic prescribing	10	19
Microbiologists involved in bedside care	10	23

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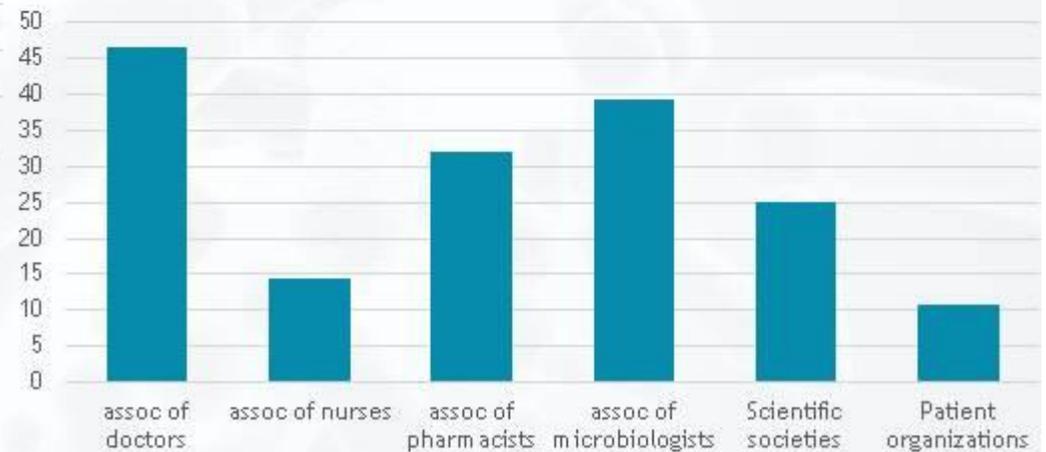
# ASP in hospitals



### Who is responsible for the content of programmes in hospitals (%)?

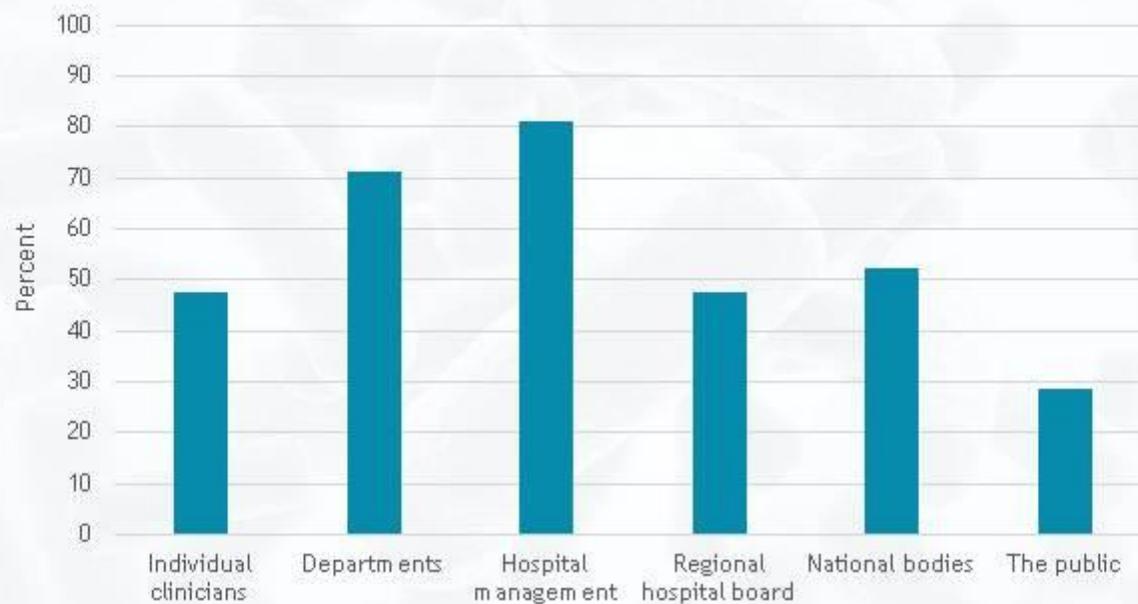


### Who was consulted (%)?



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## Who do we report success to? - who sees the result?



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## The same old questions....



- What is in place at national and local levels?
- What have the success stories been?
- What have been the barriers to implementation?
- What strategies have you used for dissemination and acceptance?
- How have you involved stakeholders such as doctors, pharmacists and nurses?
- Who do you think the core members of an Antimicrobial Stewardship Team should be for each level of care?

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# Groups



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*\* This presentation arises from the Joint Action on Antimicrobial Resistance and Healthcare-Associated Infections (EU-JAMRAI), which has received funding from the European Union in the framework of the Health Program (2014-2020) under the Grant Agreement N° 761296. Sole responsibility lies with the author and the Consumers, Health, Agriculture and Food Executive Agency is not responsible for any use that may be made of in the information contained therein.*

## Appendix 2: Implementation of antimicrobial stewardship



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# IMPLEMENTATION OF ANTIMICROBIAL STEWARDSHIP

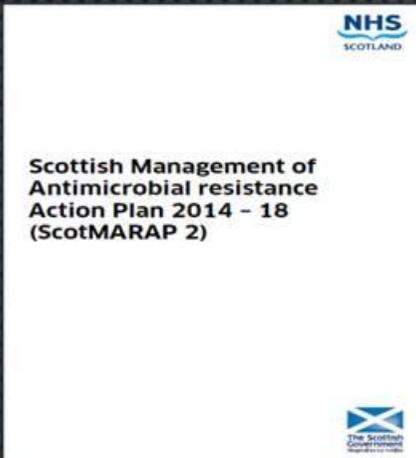
DILIP NATHWANI



University  
of Dundee



# AMR IN TROUBLED TIMES



Department of Health

Department for Environment Food & Rural Affairs

## UK Five Year Antimicrobial Resistance Strategy 2013 to 2018

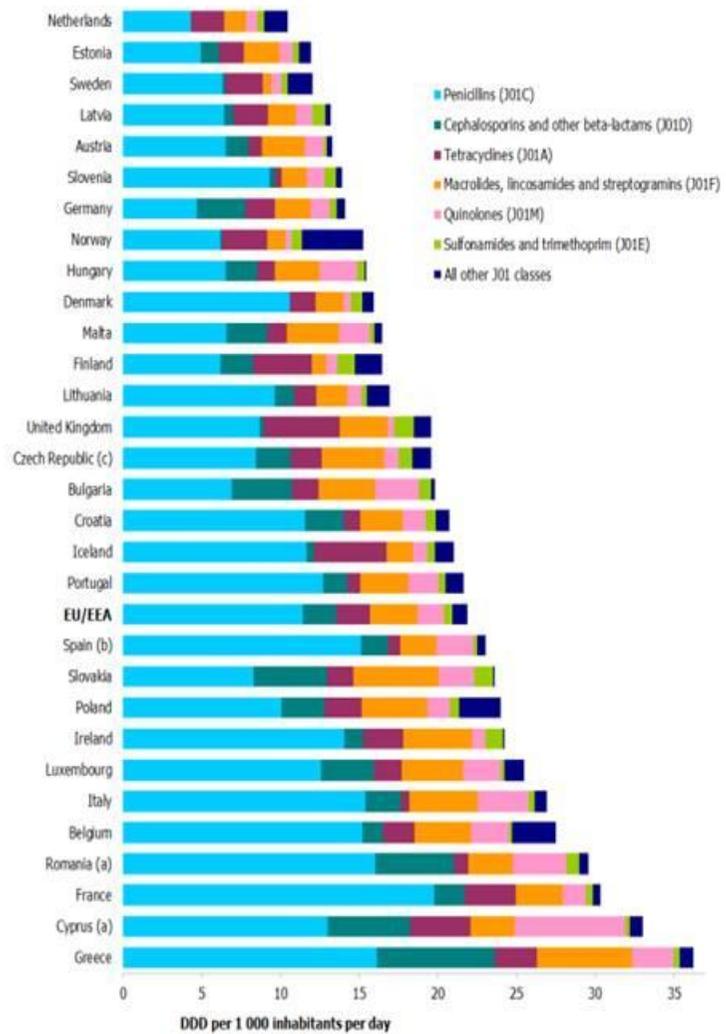
Northern Ireland Executive

Llywodraeth Cymru  
Welsh Government

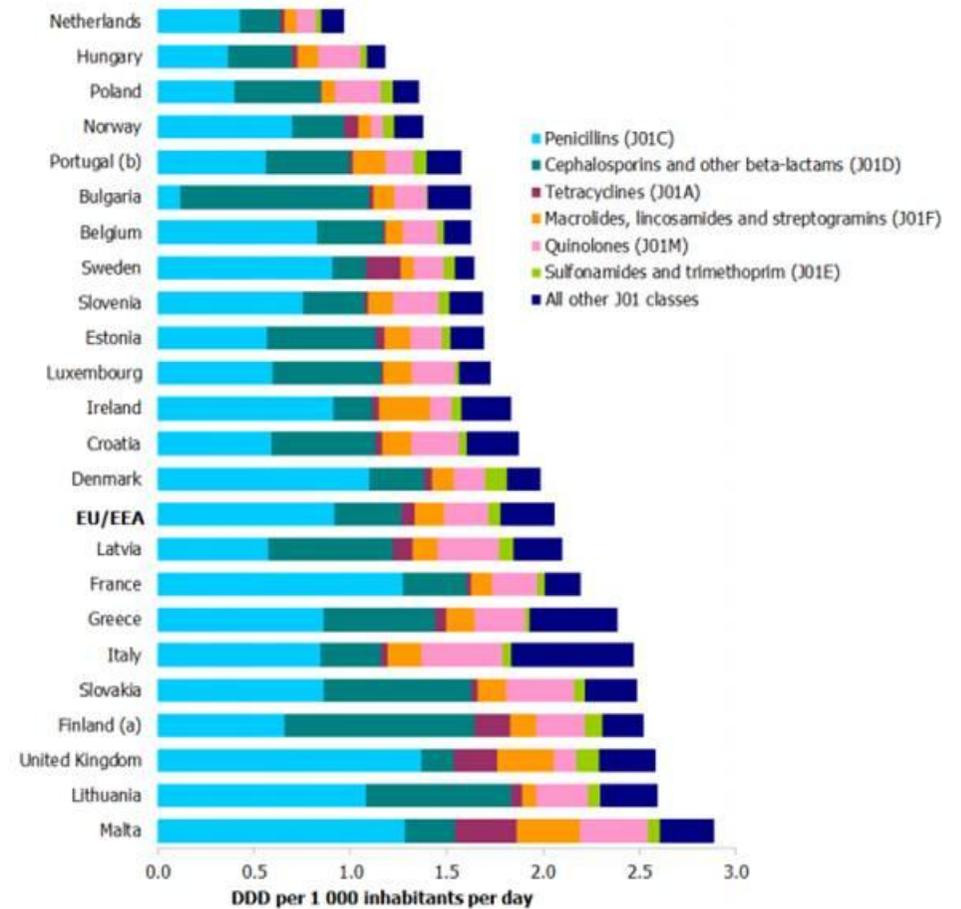
The Scottish Government  
Riaghaidh na h-Alba



**Figure 2.** Consumption of antibiotics for systemic use in the community by antibiotic group, EU/EEA countries, 2016 (at ATC group level 3, expressed as DDD per 1 000 inhabitants per day)



**Figure 5.** Consumption of antibiotics for systemic use in the hospital sector by antibiotic group, EU/EEA countries, 2016 (at ATC group level 3, expressed as DDD per 1 000 inhabitants per day)



(a) Finland: data include consumption in remote primary healthcare centres and nursing homes.

(b) Portugal: data relate to public hospitals only.

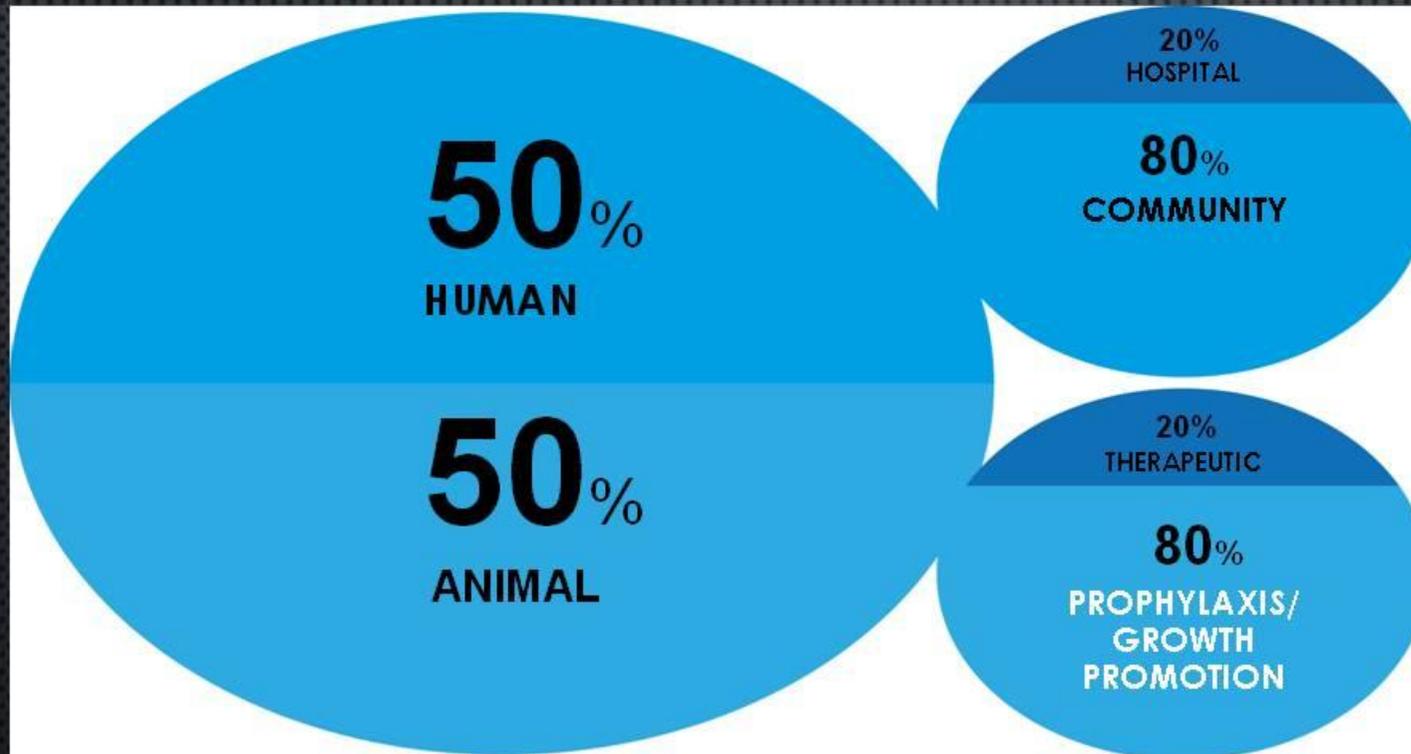
EU/EEA refers to the corresponding population-weighted mean consumption based on 23 countries that provided data.

# A SENSE OF PERSPECTIVE

WHERE USED

WHERE NOT USED

QUESTIONABLE USE



**20-50%**  
UNNECESSARY

**40-80%**  
HIGHLY QUESTIONABLE

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

# Antimicrobial consumption and resistance in adult hospital inpatients in 53 countries: results of an internet-based global point prevalence survey

Ann Versporten, Peter Zarb, Isabelle Caniaux, Marie-Françoise Gros, Nico Drapier, Mark Miller, Vincent Jarlier, Dilip Nathwani, Herman Goossens, on behalf of the Global-PPS network\*

	Antimicrobial prescriptions	Antibiotic prescriptions	Targeted treatment*	Targeted treatment (resistant organisms)*	Reason recorded†	Stop or review date recorded†	Parenteral administration‡	Guidelines available§	Compliant to local guidelines¶	No guidelines available
Eastern Europe (n=653)	747	708	51 (7.8%)	42 (6.4%)	64.3%	50.5%	87.6%	79.8%	85.7%	19.2%
Northern Europe (n=2783)	3880	3536	396 (14.2%)	80 (2.9%)	81.4%	51.6%	62.2%	90.0%	83.4%	6.5%
Southern Europe (n=5534)	7674	6837	838 (15.1%)	292 (5.3%)	69.5%	29.1%	80.0%	60.5%	70.8%	29.6%
Western Europe (n=8458)	10612	9485	2204 (26.1%)	469 (5.5%)	80.5%	40.3%	64.0%	81.0%	78.7%	10.1%
Africa (n=899)	1502	1213	131 (14.6%)	25 (2.8%)	70.4%	36.6%	62.7%	49.5%	67.9%	26.7%
East and south Asia** (n=5363)	7607	6781	938 (17.5%)	287 (5.4%)	74.6%	43.5%	71.8%	76.4%	81.5%	21.4%
West and central Asia (n=1612)	2252	2084	236 (14.6%)	153 (9.5%)	72.8%	19.8%	85.2%	53.4%	66.3%	40.5%
Oceania (n=932)	1411	1226	218 (23.4%)	63 (6.8%)	85.1%	27.0%	60.5%	87.4%	73.2%	11.7%
Latin America (n=1518)	2403	2170	403 (26.5%)	231 (15.2%)	81.4%	40.3%	84.4%	76.5%	64.1%	19.9%
North America (n=2139)	3125	2752	511 (23.9%)	127 (5.9%)	84.9%	39.6%	73.1%	77.3%	85.8%	18.5%
Total (n=29 891)	41 213	36 792	5926 (19.8%)	1769 (5.9%)	76.9%	38.3%	71.4%	74.3%	77.4%	19.2%

Data are n or %. A version of this table containing numerical data for all percentages is in the appendix. \*Patients receiving at least one antibiotic for systemic therapeutic use only (ie, health-care-associated or community-acquired infection). †Includes all antimicrobials; the total number of antimicrobial prescriptions was used to calculate percentages. ‡Patients who received at least one parenteral antibiotic for systemic use. §Antibiotic prescriptions for which guidelines were available to guide antibiotic choice (not route, dose, or duration), which was calculated as all antibiotic prescription for which a local guideline was available/all antibiotic prescription. ¶The number of antibiotic prescriptions for which guidelines were available was used as the denominator to calculate percentages. ||The total number of antibiotic prescriptions was used as the denominator to calculate percentages. \*\* Includes south, east, and southeast Asia.

Table 4: Overview of antimicrobial and antibiotic quality indicators for adult inpatients by region, year 2015

Lancet Glob Health 2018; 6: e619-29

# EVIDENCE FOR AMS EFFECTIVENESS

## INTERVENTIONS TO IMPROVE ANTIBIOTIC PRESCRIBING PRACTICES FOR HOSPITAL INPATIENTS

### Authors' conclusions:

We found high-certainty evidence that interventions are effective in increasing compliance with antibiotic policy and reducing duration of antibiotic treatment. Lower use of antibiotics probably does not increase mortality and likely reduces length of stay. Additional trials comparing antibiotic stewardship with no intervention are unlikely to change our conclusions. Enablement consistently increased the effect of interventions, including those with a restrictive component. Although feedback further increased intervention effect, it was used in only a minority of enabling interventions. Interventions were successful in safely reducing unnecessary antibiotic use in hospitals, despite the fact that the majority did not use the most effective behaviour change techniques. Consequently, effective dissemination of our findings could have considerable health service and policy impact. Future research should instead focus on targeting treatment and assessing other measures of patient safety, assess different stewardship interventions, and explore the barriers and facilitators to implementation. More research is required on unintended consequences of restrictive interventions.

Less antibiotics  
No increase in mortality  
Reduced LOS



9 February 2017

# Effect of antibiotic stewardship on the incidence of infection and colonisation with antibiotic-resistant bacteria and *Clostridium difficile* infection: a systematic review and meta-analysis

Positive impact on MDR-GNB infections

Lancet Infect Dis 2017

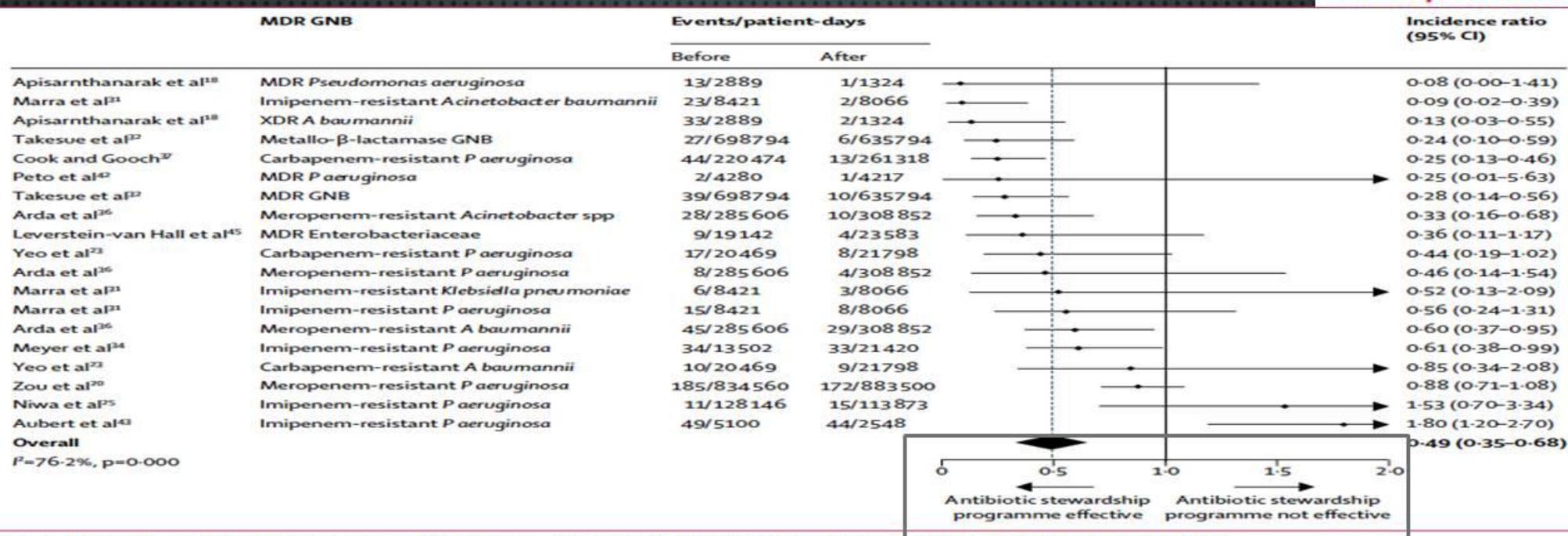


Figure 2: Forest plot of the incidence ratios for studies of the effect of antibiotic stewardship on the incidence of MDR GNB. GNB=Gram-negative bacteria. MDR=multidrug-resistant. XDR=extensively drug-resistant.

### Antimicrobial Stewardship in Outpatient Settings: A Systematic Review

Dimitri M. Drekonja, MD, MS;<sup>1,2</sup> Gregory A. Filice, MD;<sup>1,2</sup> Nancy Greer, PhD;<sup>3</sup> Andrew Olson, MD;<sup>1,4</sup>  
Roderick MacDonald, MS;<sup>3</sup> Indulis Rutks, BS;<sup>3</sup> Timothy J. Wilt, MD, MPH<sup>1,3</sup>

### A Systematic Review of Antimicrobial Stewardship Interventions in the Emergency Department

Mia Losier<sup>1</sup>, Tasha D. Ramsey, PharmD<sup>1,2</sup>,  
Kyle John Wilby, PharmD<sup>3</sup>, and Emily K. Black, PharmD<sup>1</sup>

EVIDENCE-BASED CHILD HEALTH: A COCHRANE REVIEW JOURNAL  
*Evid.-Based Child Health* 1: 623–690 (2006)  
Published online in Wiley InterScience (www.interscience.wiley.com). DOI: 10.1002/ebch.23

### Interventions to improve antibiotic prescribing practices in ambulatory care (Review)

Arnold SR, Straus SE

### Growing evidence from all sectors

*Annals of Pharmacotherapy*  
2017, Vol. 51(9) 774–790  
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DOI: 10.1177/1060028017709820  
journals.sagepub.com/home/aop  
SAGE



Review Article

### Antibiotic Stewardship Programs in Nursing Homes: A Systematic Review

Diana Feldstein MD, MPH<sup>a, R, B</sup>, Philip D. Sloane MD, MPH<sup>B, C</sup>, Cynthia Feltner MD, MPH<sup>C, D</sup>

- <sup>a</sup> Division of Geriatric Medicine, Center for Aging and Health, University of North Carolina, Chapel Hill, NC
- <sup>b</sup> Department of Family Medicine, University of North Carolina, Chapel Hill, NC
- <sup>c</sup> Cecil G. Sheps Center for Health Services Research, University of North Carolina, Chapel Hill, NC
- <sup>d</sup> Department of Medicine, University of North Carolina, Chapel Hill, NC

A total of 14 studies rated good or fair quality were included. Eight studies reported a reduction in antibiotic prescriptions. Ten found an increase in adherence to guidelines proposed by the studied ASP. None reported a statistically significant change in NH mortality rates, *C. difficile* infection rates, or hospitalizations.

#### Discussion

The limited research to date suggests that NH ASPs can affect intermediate health outcomes, but not key health outcomes or **health care utilization**.

#### Conclusion

Larger trials evaluating more intensive interventions over longer durations may be needed to determine whether ASPs in NHs improve health outcomes as they have in hospitals.

### Antibiotic stewardship interventions in hospitals in low-and middle- income countries: a systematic review

Christophe Van Dijck,<sup>a</sup> Erika Vlieghe<sup>b</sup> & Janneke Arnoldine Cox<sup>c</sup>

*Bull World Health Organ* 2018;96:266–280 | doi: <http://dx.doi.org/10.2471/BLT.17.203448>

# EVIDENCE FOR AMS ACROSS HEALTH SYSTEMS, RESOURCE SETTINGS

WE STILL NEED MORE EVIDENCE OF WHAT WORKS WHERE, FOR HOW LONG AND WHY ?

HOWEVER IN THE MEANTIME .....

Editorial Note

CMI policy on antimicrobial stewardship research

Clinical Microbiology and Infection 24 (2018) 91–92

**Table 1**

Recommended resources for design and reporting of antimicrobial stewardship interventional studies

#### Design of interventional study

- Recommended designs: randomized, cluster-randomized trials and controlled interrupted time series quasi-experimental studies [7,15].
- Use implementation science to design intervention, which should be tailored to (evaluation of) existing barriers and facilitators [7,15,16].
- Assess impact of intervention on balanced set of *a priori*-defined and relevant criteria [7,15–17].
  - Process measures (e.g. uptake of intervention).
  - Outcome measures (e.g. antibiotic use, resistance, clinical outcomes).
  - Unintended consequences.
  - Economic evaluation if possible [18].
- Sustainability of medium- to long-term impact of intervention should be monitored.

## PARACHUTE APPROACH TO EVIDENCE BASED MEDICINE

Malcolm Potts, Ndola Prata, Julia Walsh, Amy Grossman

Waiting for the results of randomised trials of public health interventions can cost hundreds of lives, especially in poor countries with great need and potential to benefit. If the science is good, we should act before the trials are done



Smith G, Pell JP. Parachute use to prevent death and major trauma related to gravitational challenge: systematic review of randomised controlled trials. *BMJ* 2003;327:1459-61.



*BMJ* 2006;333:701-3

WHAT IS BEING  
IMPLEMENTED- HUMAN AMS  
?

**JUST DO IT.**

## MONITORING GLOBAL PROGRESS ON ADDRESSING ANTIMICROBIAL RESISTANCE

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



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.

### Optimizing the use of antimicrobial medicines in human and animal health (Global Action Plan Objective 4)

to preserve antimicrobial effectiveness [5,11]. The second wave of this national self-assessment survey shows that there has been some action on this front, but there is also substantial room for improvement. For example, 123 countries (79.9%) have policies in place to regulate the sale of antimicrobials including the requirement of a prescription for human use, which is a policy that has been shown to be effective in reducing antimicrobial use in some parts of the world [12,13]. Yet these policies are less common in low-income countries, where only 52.6% of countries (n=10) have these policies. 102 countries (66.2%) have policies to optimize antimicrobial use at Level 3 or higher; however, only 7 countries globally have reached Level 5 and are systematically sending data back to prescribers, another policy shown to reduce antimicrobial prescribing among physicians [14]. However, 26.6% of responding countries (n=41) have guidelines in place to enable appropriate use of antimicrobials or optimize antibiotic use (Level 4–5) in human health facilities.

## MONITORING GLOBAL PROGRESS ON ADDRESSING ANTIMICROBIAL RESISTANCE

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

Level 1

*No national AMR action plan.*

Level 2

*National AMR action plan under development*

Level 3

*National AMR action plan developed.*

Level 4

*National AMR action plan approved by government that reflects Global Action Plan objectives, with an operational plan and monitoring arrangements.*

Level 5

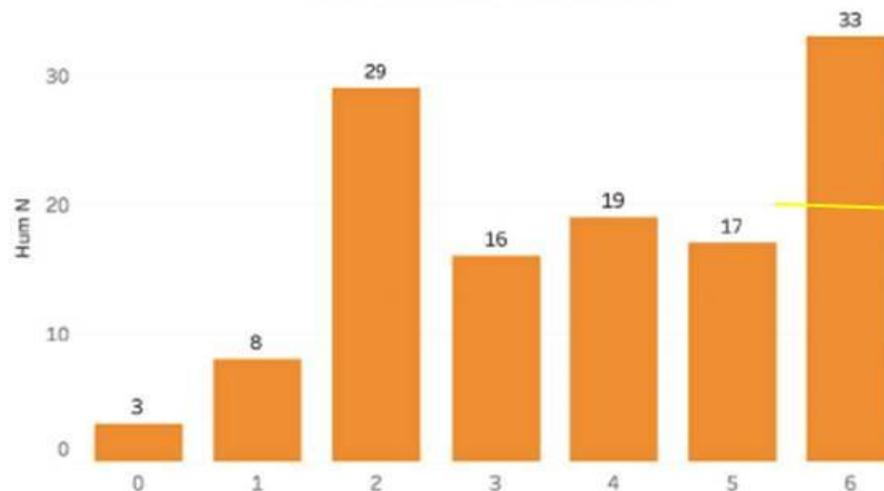
*National AMR action plan has funding sources identified, is being implemented and has relevant sectors involved with a defined monitoring and evaluation process in place.*

## Optimizing the use of antimicrobial medicines in human and animal health (Global Action Plan Objective 4)

Implementation Of 6 key human indicators to Level 3 or above

### Human indicators

Number of Implemented NAP Indicators



Implementing 5/ 6 Indicators Spain, Denmark, Austria, Sweden, Finland, Norway, Netherlands

# WE HAVE JUST HEARD SIMILAR RESULTS FROM EUROPEAN SURVEY

## ASP in European hospitals



<u>Do/did you have...</u>	<u>Yes</u>	<u>Total</u>
<u>Earmarked funds for development</u>	5	23
<u>Earmarked funds for implementation</u>	5	23
<u>A toolkit available</u>	13*	23
<u>A communication strategy</u>	13*	23
<u>Indicators for effect of ASP</u>	19*	23
<u>Routine audits of antibiotic prescribing</u>	10	19
<u>Microbiologists involved in bedside care</u>	10	23

**AMS IN HUMAN IS A WHOLE SYSTEMS  
APPROACH: DOING AMS IN ISOLATION  
IN ONE COMPONENT OF THE SYSTEM  
WILL NOT BE SUCCESSFUL IN THE LONG  
TERM**

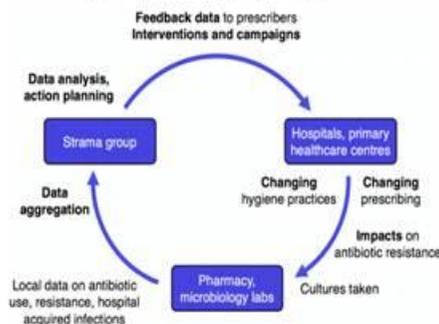
# Managing responsible antimicrobial use: perspectives across the healthcare system

Clinical Microbiology and Infection 23 (2017) 441–447

O.J. Dyar<sup>1,4</sup>, G. Tebano<sup>2,4</sup>, C. Pulcini<sup>3,\*</sup>, on behalf of ESGAP (ESCMID Study Group for Antimicrobial stewardship)



Fig. 1. Health system building blocks, and their interconnectedness (adapted from [1]).



Strama: Swedish strategic programme against antibiotic resistance

Fig. 2. Cyclical learning processes within the Strama network (adapted from [9]).

Example of One system Approach



## Key features of Strama

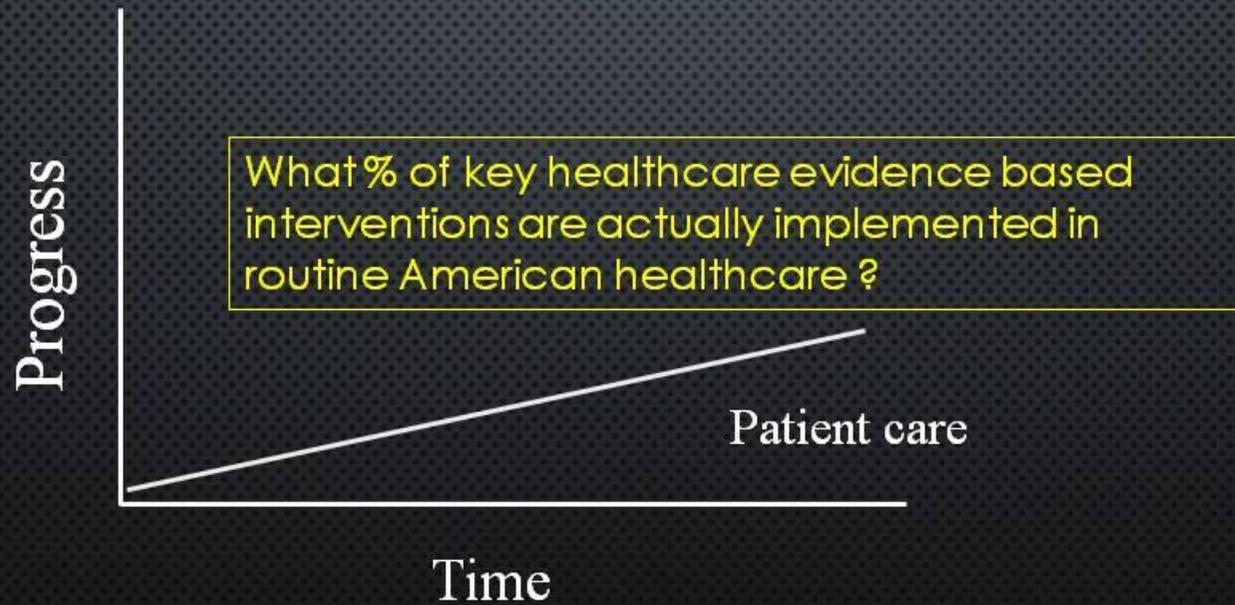
**Grounded in daily practice:** Face-to-face visits at primary care practices are commonly carried out within regions. These allow feedback of data to prescribers and encourage prescribers to share their perceived barriers to responsible antibiotic use.

**Regional autonomy:** The decentralized organization of Strama has stimulated local goal setting and local piloting of improvement measures, accepting that there are multiple paths to the shared goal.

**Multidisciplinary at each level:** The regional Strama groups are led by a county medical officer (usually an infectious diseases doctor), and always contain specialists in primary care, clinical microbiology, infectious diseases, ear nose and throat, and paediatrics, together with pharmacists and representation from the local drug and therapeutics committee. Nurses and dentists are included in some regional groups. The national level Strama council involves clinical representation that mirrors the regional groups, and co-operates with 20 authorities across public health, animal health, food, and the environment, in part through an intersectoral coordinating mechanism introduced in 2012.

**Data-driven:** Data collection and analyses are coordinated and standardized, resulting in robust datasets for monitoring antibiotic use and resistance at national level, and for providing high resolution feedback at regional levels. Data collection has even included monitoring for adverse events of under-prescribing. IT systems are now being developed in many counties to provide individual prescriber feedback, including comparisons with local colleagues.

# Quality Improvement: Bridging the Implementation Gap



Are you  
Happy with that ?

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

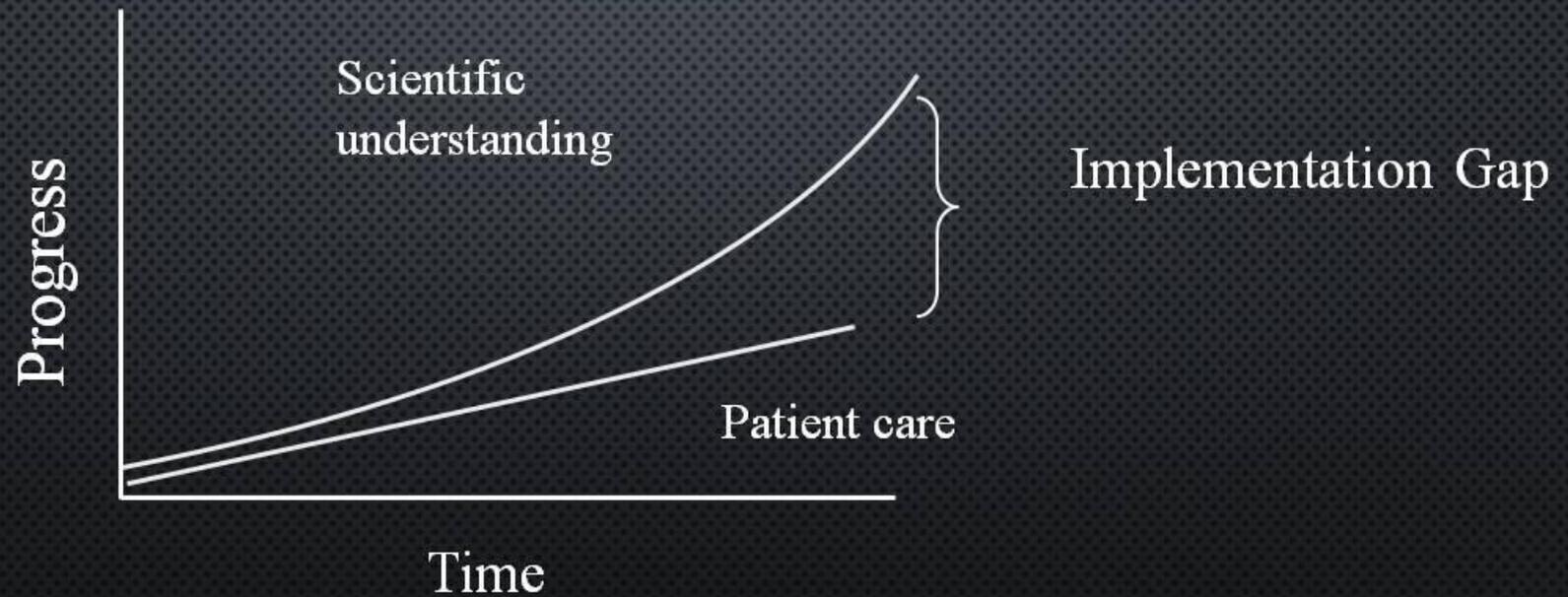
Variable	No. of Indicators	No. of Participants Eligible	Total No. of Times Indicator Eligibility Was Met	Percentage of Recommended Care Received (95% CI)*
Overall care	439	6712	98,649	54.9 (54.3–55.5)
Type of care				

**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.

# Quality Improvement: Bridging the Implementation Gap



# The Break-Even Point:

WH  
Imp  
Wi

“Society’s huge investment in technological innovations that only modestly improve efficacy, by consuming resources needed for improved delivery of care, may cost more lives than it saves.”

Steven H. Woolf, MD, MPH<sup>1</sup>

Robert E. Johnson, PhD<sup>2</sup>

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## ABSTRACT

Society invests billions of dollars in the development of new drugs and technologies but comparatively little in the fidelity of health care, that is, improving systems for delivering care.

“Health, economic, and moral arguments make the case for spending less on technological advances and more on improving systems for delivering care.”

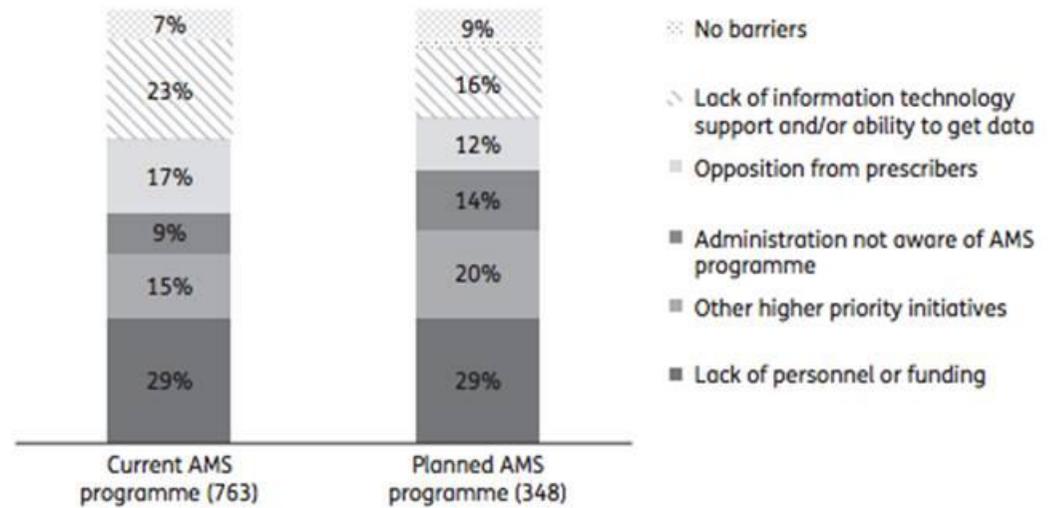
patients. Society’s huge investment in technological innovations that only modestly improve efficacy, by consuming resources needed for improved delivery of care, may cost more lives than it saves. The misalignment of priorities is driven partly by the commercial interests of industry and by the public’s appetite for technological breakthroughs, but health outcomes ultimately suffer. Health, economic, and moral arguments make the case for spending less on technological advances and more on improving systems for delivering care.

*Ann Fam Med* 2005;3:545-552. DOI: 10.1370/afm.406.

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

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

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

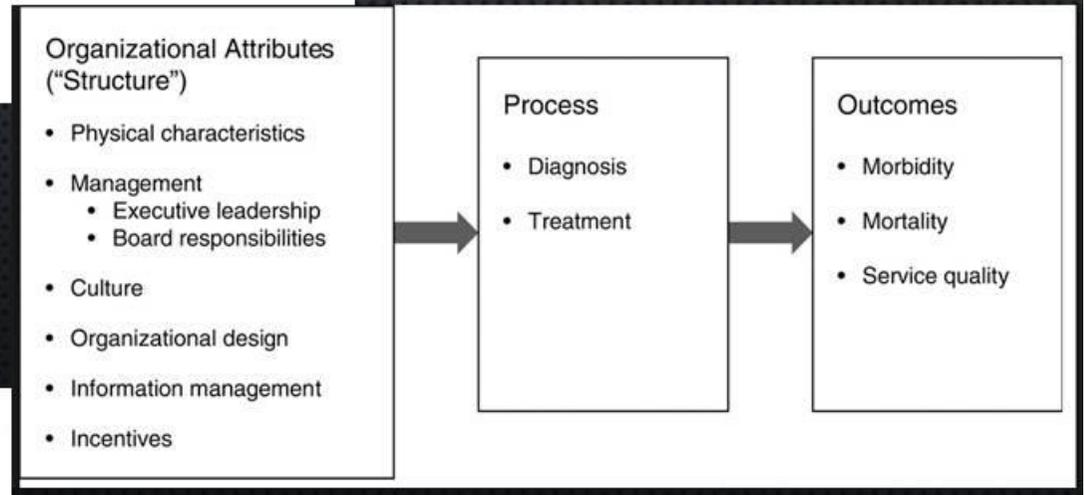
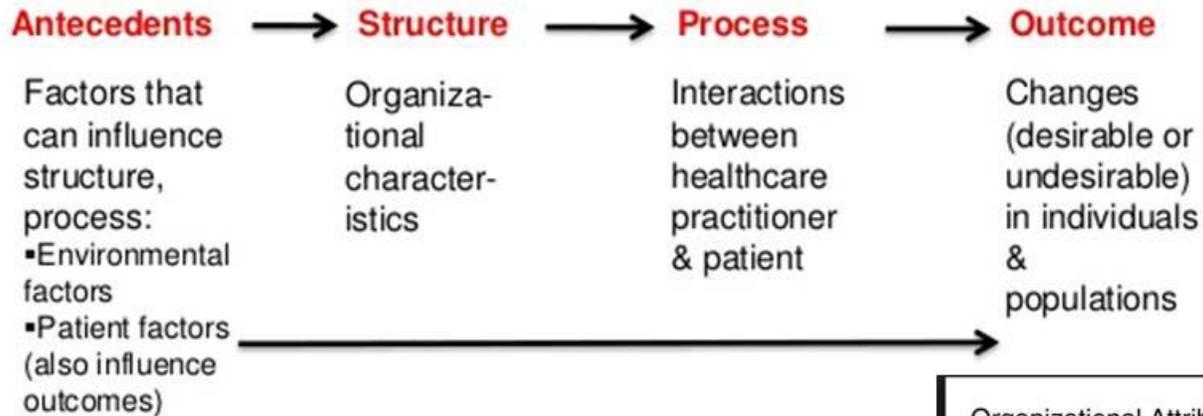


	Barriers to delivering a functional and effective AMS programme					
	Lack of personnel or funding, n (%)	Other higher priority initiatives, n (%)	Administration not aware of AMS programme, n (%)	Opposition from prescribers, n (%)	Lack of information technology support and/or ability to get data, n (%)	No barriers, n (%)
Current AMS programme (763)	219 (29)	118 (15)	68 (9)	128 (17)	175 (23)	55 (7)
Planned AMS programme (348)	100 (29)	69 (20)	48 (14)	43 (12)	57 (16)	31 (9)

Figure 1. Barriers to delivering a functional and effective AMS programme.

# Quality Assessment

## Donabedian's Structure – Process - Outcome



Donabedian A, Wheeler JR, Wyszewianski L. Quality, cost, and health: an integrative model. *Med Care*. 1982 Oct;20(10):975-92.

# CREATING, SUPPORTING AND IMPLEMENTING ANTIMICROBIAL STEWARDSHIP

## 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

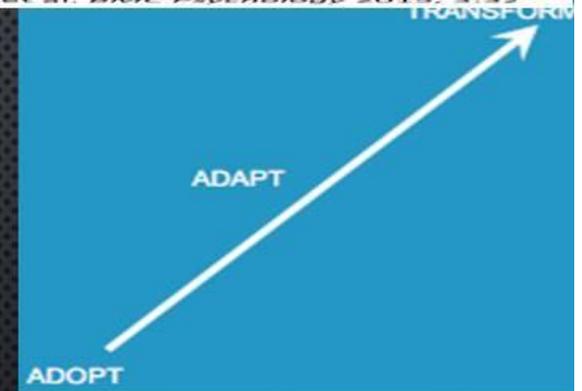
Lack of awareness  
Competing demands  
Limited resources and skills  
Misalignment of priorities

Sustained application in routine care

Balas EA, Boren SA. *Yearb Med Inform* 2000, 1: 65-70; Bauer MS, et al. *BMC Psychology* 2015, 3:192

Strategy, Leadership,  
Organisation & Systems  
and Resources

Structure [S] + Process [P*i*]  
= Outcomes [O*d*]



# AMS: STRUCTURE + PROCESS = OUTCOMES

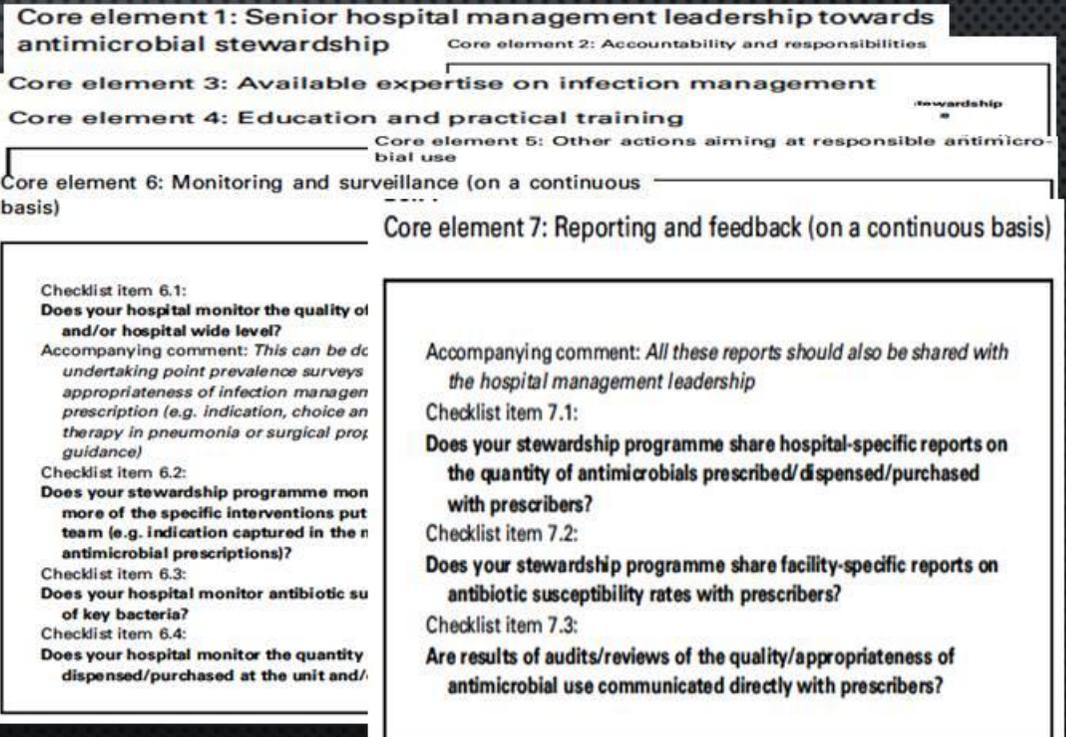
## Developing core elements and checklist items for global hospital antimicrobial stewardship programmes: a consensus approach

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

NEW!

### 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 xxx (2018) 1–6

## SYSTEMATIC REVIEW AND 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 0.25–0.75; 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.

# Antibiotic Stewardship in Small Hospitals: Barriers and Potential Solutions

HEALTHCARE EPIDEMIOLOGY • CID 2017:65 (15 August) • 691

Edward Stenehjem,<sup>1,2</sup> David Y. Hyun,<sup>3</sup> Ed Septimus,<sup>4,5</sup> Calvin C. Yu,<sup>6</sup> Marc Meyer,<sup>7</sup> Deepa Raj,<sup>3</sup> and Arjun Srinivasan<sup>8</sup>

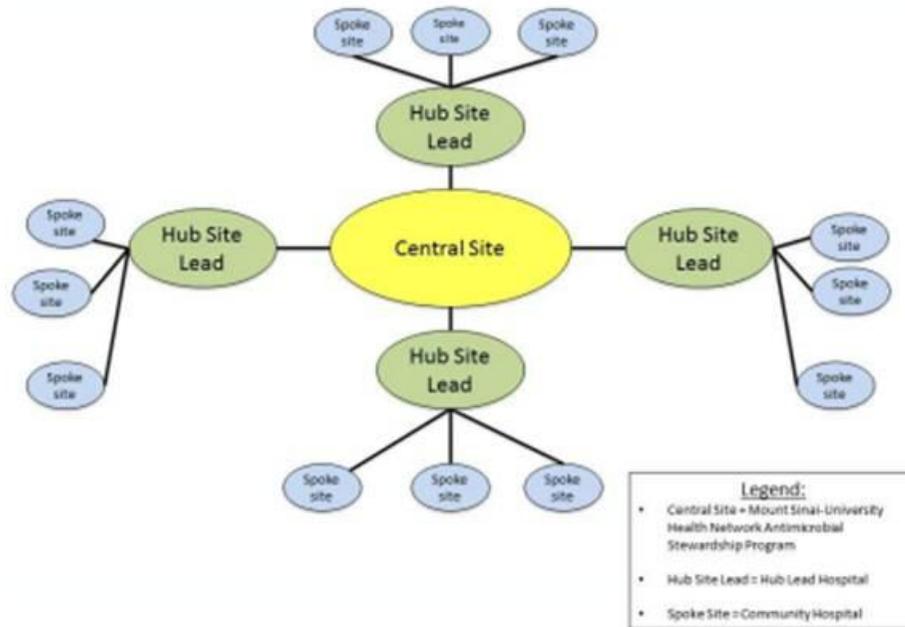
<sup>1</sup>Division of Clinical Epidemiology and Infectious Diseases, Intermountain Medical Center, Murray, Utah; <sup>2</sup>Division of Infectious Diseases, Stanford University School of Medicine, California; <sup>3</sup>The Pew Charitable Trusts, Washington, District of Columbia; <sup>4</sup>Clinical Services Group, Hospital Corporation of America, Nashville, Tennessee; <sup>5</sup>Texas A&M Health Science Center, College of Medicine Houston; <sup>6</sup>Department of Quality and Infectious Diseases, Southern California Permanente Medical Group, Kaiser Permanente Southern California, Pasadena; <sup>7</sup>Infection Prevention and Clinical Pharmacy, Southwest Health System, Cortez, Colorado; and <sup>8</sup>Division of Healthcare Quality Promotion, Centers for Disease Control and Prevention, Atlanta, Georgia

Antibiotic stewardship programs (ASPs) improve antibiotic prescribing. Seventy-three percent of US hospitals have <200 beds. Small hospitals (<200 beds) have similar rates of antibiotic prescribing compared to large hospitals, but the majority of small hospitals lack ASPs that satisfy the Centers for Disease Control and Prevention's core elements. All hospitals, regardless of size, are now required to have ASPs by The Joint Commission, and the Centers for Medicare and Medicaid Services has proposed a similar requirement. Very few studies have described the successful implementation of ASPs in small hospitals. We describe barriers commonly encountered in small hospitals when constructing an antibiotic stewardship team, obtaining appropriate metrics of antibiotic prescribing, implementing antibiotic stewardship interventions, obtaining financial resources, and utilizing the microbiology laboratory. We propose potential solutions that tailor stewardship activities to the needs of the facility and the resources typically available.

**Keywords.** antibiotic stewardship; small community hospital; antibiotic prescribing appropriateness.

Using local resource, with flexible & novel skills  
Leadership / multi-disciplinary  
Networks  
Tele-health  
Use of non ID clinicians  
Alignment to other AMS relate activity –  
QI, patient safety etc  
Data

Figure 1: Hub and spoke model



CANADA COMMUNICABLE DISEASE REPORT

**CCDR** SUPPLEMENT

June 18, 2015 • Volume 41 S•4

ISSN 1481-8531



Original article

**Antibiolor, the Lorraine antibiologic network: Update on 7 years of activity**

*Antibiolor, réseau lorrain d'antibiologie : bilan après sept ans de fonctionnement*

T. May<sup>a,\*,1</sup>, C. Burty<sup>a,1</sup>, B. Demoré<sup>b,1</sup>, N. Aissa<sup>c,1</sup>, J. Birgé<sup>d,1</sup>,  
C. Rabaud<sup>a,1</sup>, T. Doco-Lecompte<sup>a,1</sup>

<sup>a</sup> Service de maladies infectieuses et tropicales, CHU de Nancy, 54500 Vandœuvre, France

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<sup>c</sup> Laboratoire de microbiologie, CHU de Nancy, 54000 Nancy, France

<sup>d</sup> 57220 Boulay, France

Received 27 June 2011; received in revised form 21 October 2011; accepted 29 May 2012

Available online 4 July 2012

representing the various colleges and a board of eight members.

The network includes:

- a specialized center for the management of infected patients: the Infectious and Tropical Diseases unit in the Nancy teaching hospital;
- public or private, health care or long-stay institutions: median and long stay hospitals and clinics, medicalized retirement homes requiring network membership; in 2010, 58 institutions were network members;
- community practice anti-infectious drug prescribers, pharmacists, biologists, hygienists, requiring individual network membership; in 2010, 189 practitioners were network members.

**4. Network tasks undertaken to reach previously mentioned objectives**

*4.1. Writing out guidelines*

*4.2. Evaluation of professional practice*

*4.3. Continuous education actions*

*4.3.1. An information letter: "Antibiolor Infos"*

*4.3.2. Peer visits*

*4.5. Telephone advice for antibiotic therapy*

*4.6. Collection and analysis of microbiological data on bacterial resistance and of the antibiotic consumption*

*4.7. Antibiolor Internet site: "www.antibiolor.org"*

*4.8. Epidemiological and clinical research*

# Self-Assessment of Antimicrobial Stewardship in Primary Care: Self-Reported Practice Using the TARGET Primary Care Self-Assessment Tool

Rebecca Owens <sup>1</sup>, Leah Ffion Jones <sup>1</sup> , Michael Moore <sup>2</sup>, Dirk Pilat <sup>3</sup> and Clodna McNulty <sup>1,\*</sup>

Antibiotics 2017, 6, 16; doi:10.3390/antibiotics6030016

**TARGET Self-Assessment Tool**  
What would be good practice now?

- Do you use national or local antibiotic guidance when considering how to treat common infections?  
 Yes  No
- Is the latest antibiotic guidance made available to all temporary prescribers working in your surgery?  
 Yes  No  Don't know
- Do you use back-up/delayed prescribing when appropriate?  
 Yes  No
- Have you been involved in a practice antibiotic audit in the last two years?  
 Yes  No
- Do you usually record clinical indication for antibiotic prescribed in patient notes using Read Codes?  
 Yes  No
- Reflective notes  
Characters left: 300
- What most practices should aim to do soon
- Is there a GP or nurse prescriber within your practice who takes a lead for antibiotic stewardship in the practice?  
 Yes  No  Don't know
- Do you analyse and discuss antibiotic prescribing at your practice in comparison to local indicators at least once a year?  
 Yes  No  Don't know
- Do you keep a written record and surgery action plan resulting from antibiotic audits?  
 Yes  No
- Reflective notes  
Characters left: 300
- What all antibiotic aware practices should be doing
- Do you use patient focused strategies to highlight the importance of responsible antibiotic use? For example videos and posters in clinical and waiting areas.  
 Yes  No
- Do you regularly share patient information leaflets around infections within your consultations?  
 Yes  No
- Do you have a strategy to avoid patients re-consulting with other clinicians to obtain antibiotics?  
 Yes  No
- Have you undertaken any antibiotic-related prescribing clinical courses, for example the 'Managing Acute Respiratory Tract Infections' and 'Managing UTIs' e-learning courses on the RCGP Online Learning Environment?  
 Yes  No
- Reflective notes  
Characters left: 300

Figure 1. The primary care self-assessment tool.

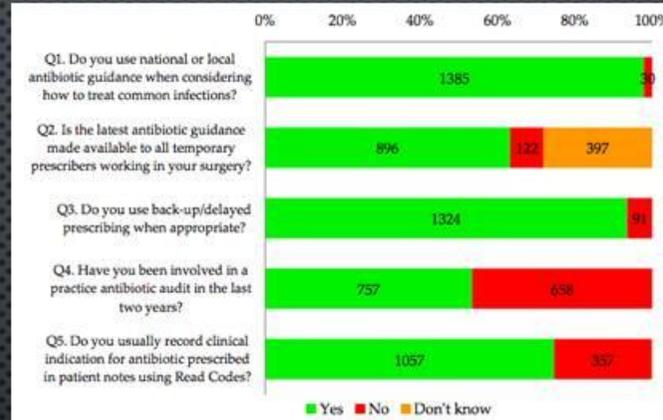


Figure 3. A visual breakdown of the five questions from the section entitled "What would be good practice now".

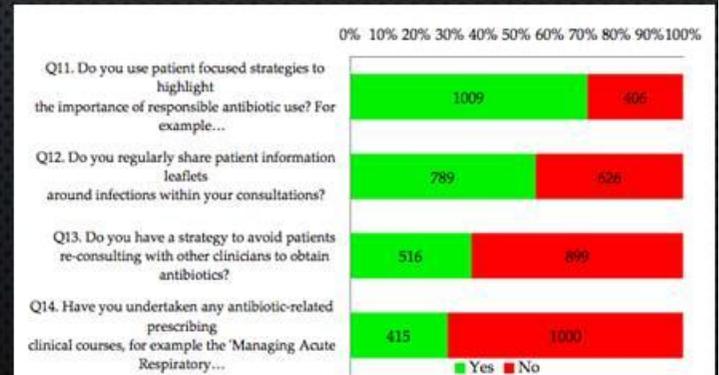


Figure 5. What all antibiotic aware practices should be doing.

# Community pharmacists—Leaders for antibiotic stewardship in respiratory tract infection

*J Clin Pharm Ther.* 2018;43:302–307.

S. Essack BPharm, MPharm, PhD<sup>1</sup> | J. Bell<sup>2</sup> | A. Shephard BSc Hons, CBIOL, FSB<sup>3</sup>

**TABLE 1** The opportunities community pharmacists have for antibiotic stewardship<sup>13,36,38,39,51</sup>

## Antibiotic stewardship for community pharmacists

Liaise and consult with prescribers on:

- Antibiotic prescriptions—to promote adherence to guidelines, appropriate prescribing and optimal treatment regimens
- Updates to information on antibiotics
- Ensuring the supply chain of antibiotics meets their needs

Advise, support and educate patients on:

- Common ailments—their causes, symptoms and likely duration
- When they need to see a doctor—following assessment for severity of illness and the identification of any red flags or risk factors for serious infections
- Symptomatic treatment options for self-limiting illnesses
- Infection prevention and control—simple hygiene measures, such as handwashing, and education on how infections are caught and transmitted
- Antibiotics—what they are effective for, what antibiotic resistance is and why it is important

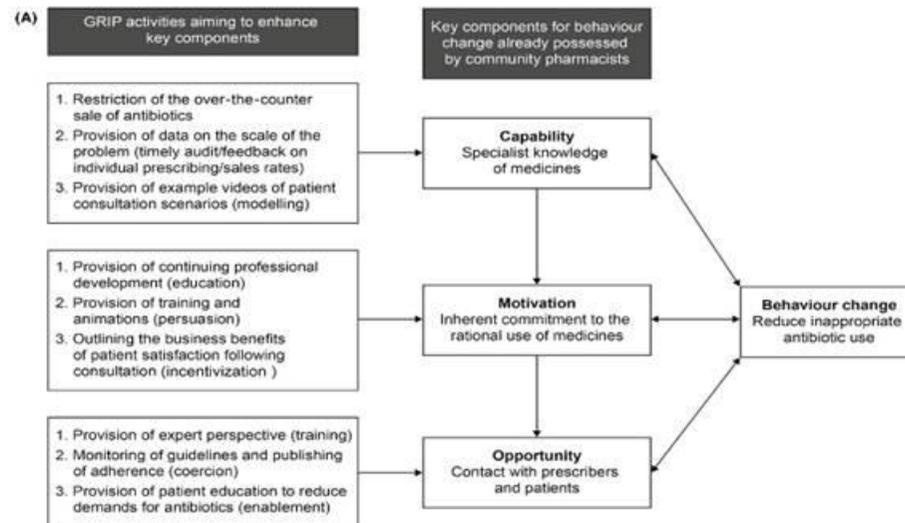
Promote the appropriate use of prescribed antibiotics, advising patients on:

- Compliance—the importance of taking the antibiotic as prescribed and following the correct dosage regimen (dose intervals, duration of treatment)
- Potential adverse effects and what to do if they occur
- Any risk of interactions

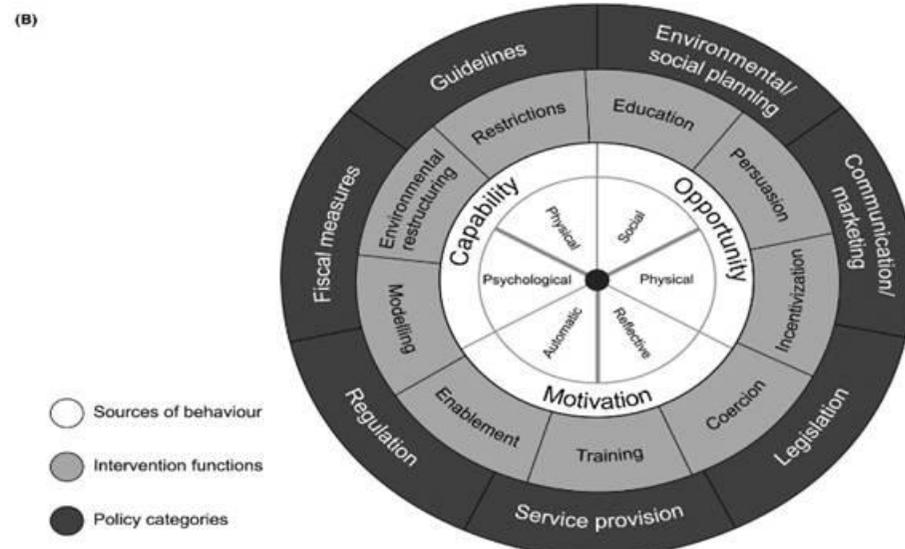
Disposal of old/unused antibiotics

Health education and promotion campaigns

Uphold dispensing regulations and ensure the quality of antibiotics by guarding against counterfeit drugs



GRIP: Global Respiratory Infection Partnership



# Strategies and challenges of antimicrobial stewardship in long-term care facilities

Clin Microbiol Infect 2015; 21: 10–19

**TABLE 4.** Common causes of antibiotic misuse in long-term care facilities

- Unnecessary antibiotic treatments for colonization (e.g. asymptomatic bacteriuria)
- Unnecessary antibiotic treatments for urinary tract infection prophylaxis
- Unnecessary antibiotic treatments for viral infections (e.g. influenza)
- Unnecessary use of topical antibiotics
- Absence of reassessment of antibiotic therapies at around day 3
- Longer-than-necessary durations

**TABLE 1.** Cross-sectional surveys of antimicrobial stewardship programmes in long-term care facilities

	ESAC [21] Europe n = 260	HALT [24] Europe n = 117	Donlon et al. [20] Ireland n = 69	Van Schooneveld et al. [23] Nebraska (USA) n = 37
Antimicrobial stewardship committee	8%	16%	16%	36%
Therapeutic formulary	16%	57%	23%	19%
Antimicrobial guidelines	50%	45%	28%	27%
Data about antibiotic consumption	—	33%	16%	81%
Data about local antimicrobial resistance profiles	9%	17%	12%	76%
Regular training of prescribers on antibiotic use	16%	22%	7%	8%
Individual antimicrobial prescribing profiles	—	27%	10%	11%
Pharmacist advice on antibiotic use	—	19%	36%	—
Regular audits assessing antibiotic use	—	—	—	81%
—, not available.				

**TABLE 3.** Main recommended antimicrobial stewardship strategies in long-term care facilities

- Discourage antibiotic prescribing without clinical examination
- Education (medical and nursing staff, patients and their families)
- Target areas where antibiotic misuse is common: antibiotic prophylaxis, bacterial colonization, topical antibiotics, durations of treatment (see Table 4)
- Use locally adapted diagnostic and therapeutic guidelines for the most common infections
- Reassess antibiotic treatments at around day 3
- Limit unnecessary microbiological investigations
- Improve the reporting from the microbiology laboratory
- Use point-of-care diagnostic tests
- Test innovative strategies and integrate antimicrobial stewardship programmes in existing quality/safety/infection prevention and control programmes

**AMS IN HUMAN IS A WHOLE SYSTEMS  
APPROACH: DOING AMS IN ISOLATION  
IN ONE COMPONENT OF THE SYSTEM  
WILL NOT BE SUCCESSFUL IN THE LONG  
TERM**

# Lessons learnt during 20 years of the Swedish strategic programme against antibiotic resistance

Download

Sigvard Mölsted, <sup>a</sup> Sonja Löfmark, <sup>b</sup> Karin Carlin, <sup>b</sup> Mats Erntell, <sup>c</sup> Olov Aspevall, <sup>d</sup> Lars Braa, <sup>e</sup> Hakan Hanberger, <sup>e</sup> Katarina Hedin, <sup>f</sup> Jenny Hellman, <sup>b</sup> Christer Norman, <sup>b</sup> Gunilla Skoog, <sup>b</sup> Cecilia Stålsby-Lundborg, <sup>g</sup> Karin Tegmark Wisell, <sup>h</sup> Christina Åhrén <sup>i</sup> & Otto Cars <sup>b</sup>

## Box 1. Key activities of the Swedish strategic programme against antibiotic resistance at the local level

- Monitor antibiotic prescribing at the county level and in primary health-care centres, outpatient specialist clinics and hospitals. See Box 3 for systems and tools used.
- Monitor antibiotic resistance within each county in outpatient, including primary health care, and inpatient settings. Surveillance data are generated mainly from routine clinical cultures and to a lesser extent from screening programmes. The scheme is largely dependent on voluntary reporting of local data from microbiological laboratories. See Box 4 for systems and tools used.
- Participate in national point prevalence studies of antibiotic prescribing, including doctor's diagnoses in outpatient and hospital care, and of health care-associated infections in hospital care.
- Promote the implementation of treatment recommendations via regular, interactive meetings between locally respected members of the strategic programme and each primary health-care centre.
- Communicate new treatment recommendations on common infections and the consequences of antibiotic resistance, both for individuals and for society, to local health-care professionals, the media, decision-makers and the general public.
- Educate staff in primary health-care centres, day-care centres and nursing homes, as well as new parents about infections and the risks and benefits of antibiotics.
- Cooperate with other multiprofessional local groups and the national programme council, to identify common clinical problems, including diagnosis and treatment of infections in daily practice and needed studies or educational activities.
- Develop and implement stewardship programmes in health-care settings. These include a variety of strategies and outcomes, with the general aim of promoting rational use of antimicrobial agents, selection of optimal drugs, dosing, duration of therapy, route of administration and the use of antibiotic susceptibility testing to reduce the use of broad-spectrum antibiotics.<sup>1</sup>

## Box 2. Key activities of the Swedish strategic programme against antibiotic resistance at the national level

- Coordinate information exchange across the public health, animal health, food and environment sectors. A national mechanism has been in place since 2012.
- Collect, collate and analyse local and national data on antibiotic use and resistance and the health and economic consequences of antibiotic resistance.
- Communicate data to multiprofessional local groups, other health-care professionals, the media, the general public and decision-makers.
- Develop and regularly update evidence-based national recommendations for treatment of common infections in primary health care.
- Initiate national point prevalence surveys of antibiotic prescribing and health care-associated infections in outpatient and inpatient care.
- Analyse collected data to identify gaps between evidence and practice. See Box 3 and Box 4 for systems and tools used.
- Set up and support studies to fill identified knowledge gaps and direct interventions and coordinated actions.
- Support multiprofessional local groups in the implementation of infection treatment recommendations, e.g. by producing locally adapted materials and local educational meetings and events.
- Arrange annual national forums and host a website (<http://www.strama.se>) as platforms for networking and sharing of best practice among counties.
- Participate in international networks, e.g. European surveillance of antimicrobial consumption network and European antimicrobial resistance surveillance network and international collaborations, including the World Health Organization.

## Box 3. Systems and tools in Sweden to monitor prescribers' adherence to antibiotic treatment recommendations

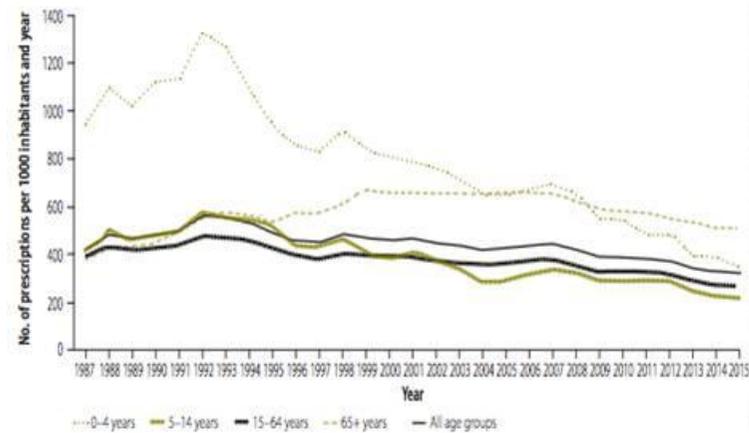
- Point prevalence surveys of infections<sup>1</sup> and antibiotic use in primary health care (years 2000, 2002 and 2005). Manual registrations were made by general practitioners in 5/21 counties, covering the doctor's diagnosis, the use of diagnostic tests, symptoms and signs and antibiotic treatment during one week each year.
- System for retrieving data on antibiotic prescribing and diagnosis collected annually (since year 2007) from the primary health-care register of infections in Sweden.<sup>14</sup> Data are extracted from medical records from 60–90 primary health-care centres, with a listed population of approximately 600 000 inhabitants out of the total population of 10 million.
- Project to develop standardized collection and evaluation of data from electronic medical records in primary health care that is uniform and comparable over time (started at the Public Health Agency of Sweden in the year 2013).<sup>15</sup>
- Annual national point prevalence survey on antibiotic consumption and health care-associated infections in long-term care facilities (started at the Public Health Agency in the year 2014),<sup>16</sup> with the aim of supporting preventive work.
- Point prevalence surveys of infections and antibiotic use in a large sample of Swedish acute care hospitals by local multiprofessional groups (years 2003, 2004, 2006, 2008 and 2010).<sup>17</sup>
- Point prevalence surveys of health-care associated infections performed by health-care providers and the Swedish Association of Local Authorities and Regions (twice yearly 2008 to 2014 and then annually).
- System for extracting data on the indications for antibiotic treatment, diagnoses and risk factors, and on operations and other patient interventions. Data are extracted from electronic health records at the point of prescription. The anti-infection tool was initiated in 2010 by the Swedish Association of Local Authorities and Regions and was implemented in nearly all Swedish hospitals by 2014. Local multiprofessional groups have an important role in the interpretation and feedback of data to prescribers.

# Lessons learnt during 20 years of the Swedish strategic programme against antibiotic resistance

Download

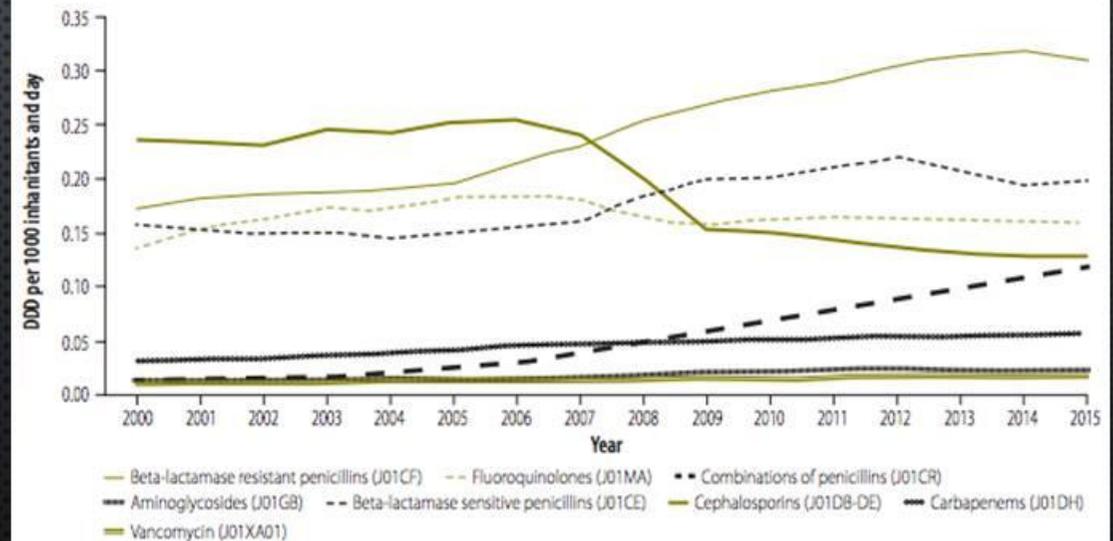
Sigvard Mölsted, <sup>a</sup> Sonja Löfmark, <sup>b</sup> Karin Carlin, <sup>b</sup> Mats Erntell, <sup>c</sup> Olov Aspevall, <sup>b</sup> Lars Braa, <sup>d</sup> Hakan Hanberger, <sup>e</sup> Katarina Hedin, <sup>f</sup> Jenny Hellman, <sup>b</sup> Christer Norman, <sup>b</sup> Gunilla Skoog, <sup>b</sup> Cecilia Stålsby-Lundborg, <sup>g</sup> Karin Tegmark Wisell, <sup>h</sup> Christina Åhrén <sup>i</sup> & Otto Cars <sup>b</sup>

Fig. 1. Sales of antibiotics for systemic use in outpatient care, Sweden, 1987–2015



Notes: Includes all antibiotic sales on prescriptions, presented as prescriptions per 1000 inhabitants and year for both sexes by different age groups. Source: Public Health Agency of Sweden, 2016.<sup>1</sup>

Fig. 2. Types of antibiotics commonly used within hospital care, Sweden, 2000–2015



DDD: defined daily doses.

Notes: Includes all sales to hospitals, nursing homes and other health-care units. Text in brackets indicate anatomical therapeutic chemical classification codes. Source: Public Health Agency of Sweden, 2016.<sup>1</sup>

## STRUCTURAL INDICATORS

= S

MEASURE WHETHER GOVERNANCE STRUCTURES ARE IN PLACE FOR STEWARDSHIP SUCH AS: DOES A HOSPITAL HAVE AN ANTIMICROBIAL TEAM WHICH MEETS REGULARLY, REPORTS TO SENIOR MANAGEMENT AND HAS AN ACTION PLAN

## PROCESS INDICATORS

= P

MEASURE SYSTEMS IN PLACE FOR STEWARDSHIP SUCH AS A SURVEILLANCE PROGRAMME FOR ANTIBIOTIC USE, A PROGRAMME OF AUDITS, EDUCATION FOR HEALTHCARE STAFF

## OUTCOME INDICATORS

= O

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).

# Metrics for quantifying antibiotic use in the hospital setting: results from a systematic review and international multidisciplinary

**Table 1.** Definitions of included metrics

Defined daily dose (DDD)
Hospital-adjusted defined dose (haDDD)
Prescribed daily dose (PDD)
Recommended daily dose (RDD)
Doses/units
Packages
Prescriptions
Days of therapy (DOT) <sup>a</sup>
Agent days
Length of therapy (LOT) or duration of treatment (DOT) or days of therapy
Treatment courses
Length of stay (LOS) or average length of stay (ALOS)
Patients
Drug utilization index (DUI)
Antibiotic costs
Drug cost index 90% (DC 90%)

**Table 3.** The final set of 12 evidence-based and consensually validated quantity metrics for antibiotic use in the inpatient setting

Inpatient quantity metric (IQM)	Quantity
IQM 1: Defined daily doses (DDDs) per 100(0) PDs/BDs/OBDs <sup>a</sup>	
IQM 2: Defined daily doses (DDDs) per admission	
IQM 3: Defined daily doses (DDDs) per (100 bed-days per CMI <sup>b</sup> )	
IQM 4: Prescribed daily doses (PDDs) per 100 PDs	
IQM 5: Days of therapy (DOT) per PD	
IQM 6: Days of therapy (DOT) per patient	
IQM 7: Days of therapy (DOT) per admission	
IQM 8: Length of therapy (LOT) per admission	
IQM 9: Length of therapy (LOT) per patient	
IQM 10: Patients exposed to antibiotics per all patients	
IQM 11: Patients exposed to antibiotics per admission	
IQM 12: Antibiotic use should be preferably expressed in at least two metrics simultaneously	

<sup>a</sup>100(0) patient-days (PD)/bed-days (BDs)/occupied bed-days (OBDs).

<sup>b</sup>CMI, case mix index. This is a relative value assigned to a diagnosis-related group of patients in a medical care environment.

The costs of drugs accounting for 90% of total drug costs.

ing Centre for Drug  
se per day for a drug used  
s on antibiotic use in  
the average dose pre-  
PDD will give the average  
y varies according to the  
ne dose. When a patient  
nted. **Synonym: antibiotic**  
d by subtracting the date  
se.  
ents, irrespective of the  
r equal to days of therapy  
s administered to the  
e than one treatment  
n the day of admission to  
hospital. Patients admitted  
re antibiotics or patients  
e.  
total drug costs.

# A systematic review of quality indicators for appropriate antibiotic use in hospitalized adult patients

Marlot C. Kallen, Jan M. Prins

Department of Internal Medicine,  
Division of Infectious Diseases,  
Academic Medical Centre, University  
of Amsterdam, the Netherlands

Infectious Disease Reports 2017; volume 9:6821

**Table 2. Description of the top 10 retrieved quality indicators.**

Developed indicators	Number of articles mentioning the indicator / total number of articles	Percentage of articles mentioning the indicator
Prescribe empirical antibiotic therapy according to (local or national) guidelines	10/14	71
Switch from intravenous to oral therapy	9/14	64
Perform at least two sets of blood cultures	8/14	57
Change to pathogen-directed therapy when culture results become available	8/14	57
Timely initiation of antibiotic therapy	7/14	50
Adapt dose and dosing interval of antibiotics to renal function	7/14	50
Documentation of antibiotic plan in medical record	7/14	50
Perform a site culture	6/14	43
Discontinue antibiotic therapy if infection not confirmed	6/14	43
Duration of antibiotic therapy	6/14	43

# ANTIBIOTIC PRESCRIBING INDICATORS/METRICS

## Process measures

PROMOTED ANTIBIOTIC

RESTRICTED ANTIBIOTICS

DAYS OF LENGTH OF THERAPY

COMPLIANCE WITH ACUTE EMPIRIC GUIDANCE

DOCUMENTATION IN NOTES AND COMPLIANCE WITH POLICY

COMPLIANCE WITH SURGICAL PROPHYLAXIS

< 60 MIN FROM INCISION, < 24 HOURS AND COMPLIANCE WITH LOCAL POLICY

COMPLIANCE WITH "OTHER BUNDLES"

## Outcome measures

[we use trends and time series analysis]

ANTIBIOTIC CONSUMPTION RATES

CDI RATES

SSI RATES

SURVEILLANCE OF RESISTANT PATHOGENS

MORTALITY [SMR's]

COST OF PHARMACEUTICALS

LOS

## Balancing measures

- MORTALITY
- SSI's
- READMISSIONS TO HOSPITAL WITHIN 30 DAYS OF DISCHARGE
- ADMISSIONS TO ICU
- RATE OF COMPLICATIONS
- TREATMENT RELATED TOXICITY E.G AMINOGLYCOSIDE RELATED TOXICITY

# A framework for ensuring a balanced accounting of the impact of antimicrobial stewardship interventions

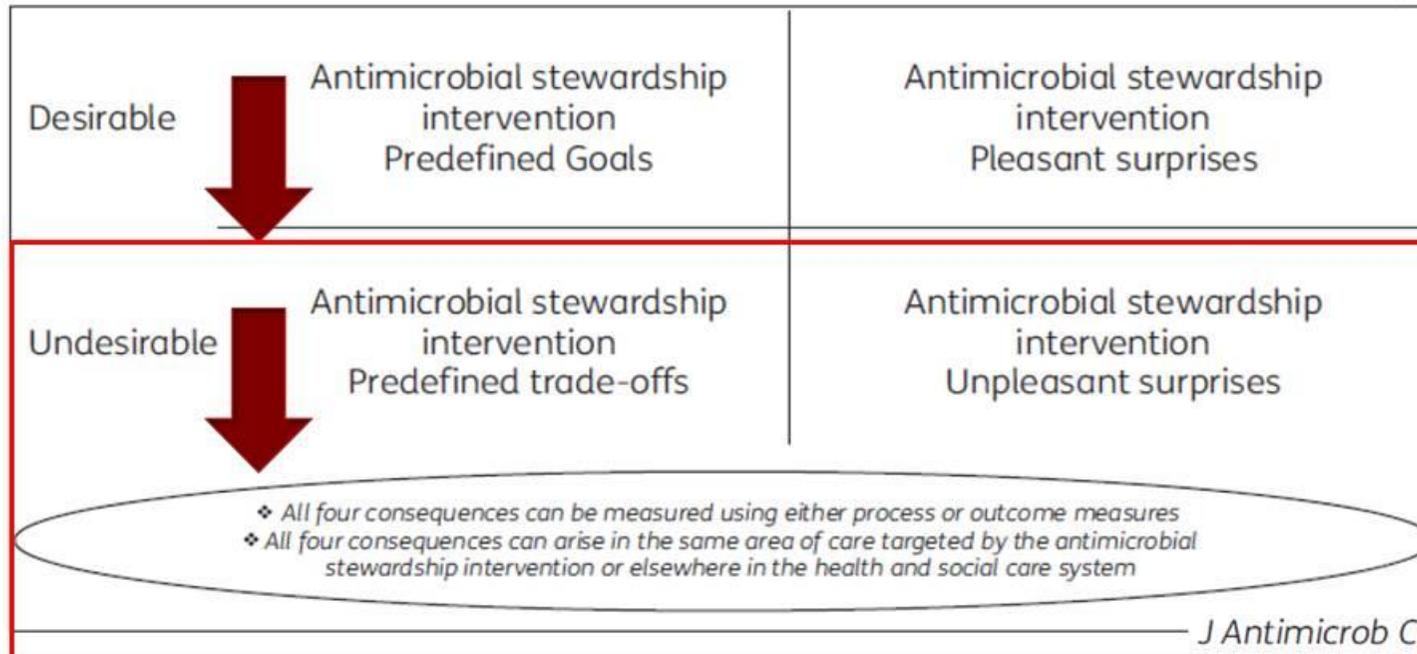
Madalina Toma<sup>1</sup>, Peter G. Davey<sup>2</sup>, Charis A. Marwick<sup>2</sup> and Bruce Guthrie<sup>1,2,\*</sup>

**Definitely expected from outset**

*Define goals and trade-offs;  
Develop initial measurement plan;  
Consider costs*

**Definitely unexpected from outset**

*Improvement pause to define surprises;  
Develop new measurement strategy;  
Consider costs*



*J Antimicrob Chemother* 2017; **72**: 3223–3231

The law of unintended consequences is the only real law of history.  
—Wall Ferguson—

Range of process & outcome measures  
For primary and secondary care

## CQUIN 2017/19

Aim	Deliverable
Improve detection and treatment of sepsis	<ul style="list-style-type: none"> <li>Timely identification of sepsis in EDs and acute inpatient settings</li> <li>Timely treatment (% of patients with sepsis who received IV antibiotics within 1 hour)</li> <li>Antibiotic review within 24-72 hours</li> </ul>
Improve antibiotic prescribing	<ul style="list-style-type: none"> <li>Reduction in antibiotic consumption per 1,000 admissions               <ul style="list-style-type: none"> <li>Total antibiotic usage</li> <li>Carbapenem usage</li> <li>Pip/tazobactam usage</li> </ul> </li> </ul>

## Quality Premium 2017/19

Aim	Deliverable
Improve antibiotic prescribing	<ul style="list-style-type: none"> <li>Sustained reduction of inappropriate antibiotic prescribing in primary care               <ul style="list-style-type: none"> <li>Items/STAR-PU equal to or below England 2013/14 mean value</li> </ul> </li> <li>Reduction of inappropriate antibiotic prescribing in UTI in primary care               <ul style="list-style-type: none"> <li>10% reduction in Trimethoprim/Nitrofurantoin prescribing ratio</li> <li>10% reduction in trimethoprim items for patients aged 70 years or more</li> </ul> </li> </ul>
Reduce Gram-ve BSIs across whole health economy	<ul style="list-style-type: none"> <li>Reduction of 10% in all <i>E. coli</i> BSI reported at CCG level independent of time of onset</li> <li>Collect and report a core primary care data set for all <i>E. coli</i> BSI in Q2-4 2017/18</li> </ul>

# DOES MORE TIMELY TREATMENT WITH ANTIBIOTICS OFFERS REDUCED MORTALITY IN SEPSIS & SEPTIC SHOCK ?

- N = ~85000, HOSPITALIZED, US RETROSPECTIVE DATA BASE [1,2]
- ONLY BENEFICIAL DIFFERENCE IN MORTALITY IN PATIENTS WITH **SEPTIC SHOCK**
  
- N=2018, PRE-HOSPITAL V EM, NETHERLANDS, >95% OF PATIENTS NO SEPTIC SHOCK [3]
- 96 MINS MEDIAN EARLIER TIME TO ADMINISTRATION OF ANTIBIOTICS
- **NO DIFFERENCE IS MORTALITY** IN THOSE WITHOUT SEPTIC SHOCK
  - 1. SEYMOUR CW ET AL NEJM 2017; 376: 2235-2244; 2. LIU VX ET AL AM J RESP CRIT CARE MED 2017; 196(7): 856-863
  - 3. ALAM N ET AL. LANCET RESP MED 2018; 6(1): 40-50
- **ANTIBIOTIC MAY BEING USED WITHOUT CARE AND CAUSING HARM**

Antibiotics for Sepsis—Finding the Equilibrium

**Sepsis** is medicine's last remaining preserve for unrestrained antibiotic prescribing. The Surviving Sepsis Campaign guidelines recommend empirical broad-spectrum therapy within one hour of triage for both sepsis and septic shock.<sup>1</sup> This recommendation, and mandates that compel it, encourage clinicians to adopt an approach of "treat first, ask questions later" for patients with any possibility of serious infection. This approach fails to account for the difficulties clinicians face with diagnosing infection, especially when patients initially present to care, and the high rate of overdiagnosis of sepsis, and thus risks promoting excess antibiotic use and causing unintended harm.

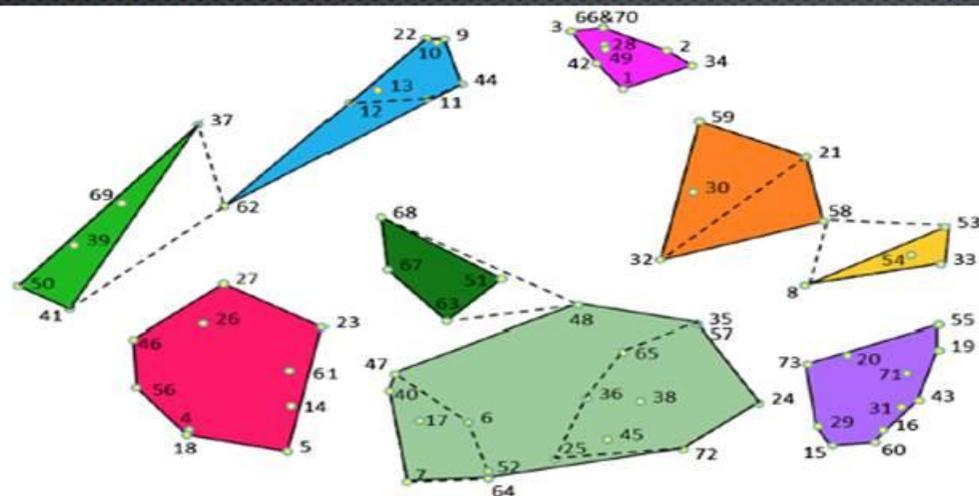
## Antibiotics for Sepsis—Finding the Equilibrium

The time has come to balance the recommendation for early and aggressive antibiotics for all patients with possible sepsis with the diagnostic uncertainty regarding sepsis and the possible harm associated with unnecessary antibiotics.

JAMA October 9, 2018 Volume 320, Number 14

Doing stewardship : Assess readiness +need,  
Prepare, Incremental Implementation, evaluate, feedback

Use of concept mapping to characterize relationships among implementation strategies and assess their feasibility and importance: results from the Expert Recommendations for Implementing Change (ERIC) study



- Engage consumers
- Use evaluative & iterative strategies
- Change infrastructure
- Adapt & tailor to the context
- Develop stakeholder interrelationships
- Utilize financial strategies
- Support clinicians
- Provide interactive assistance
- Train & educate stakeholders

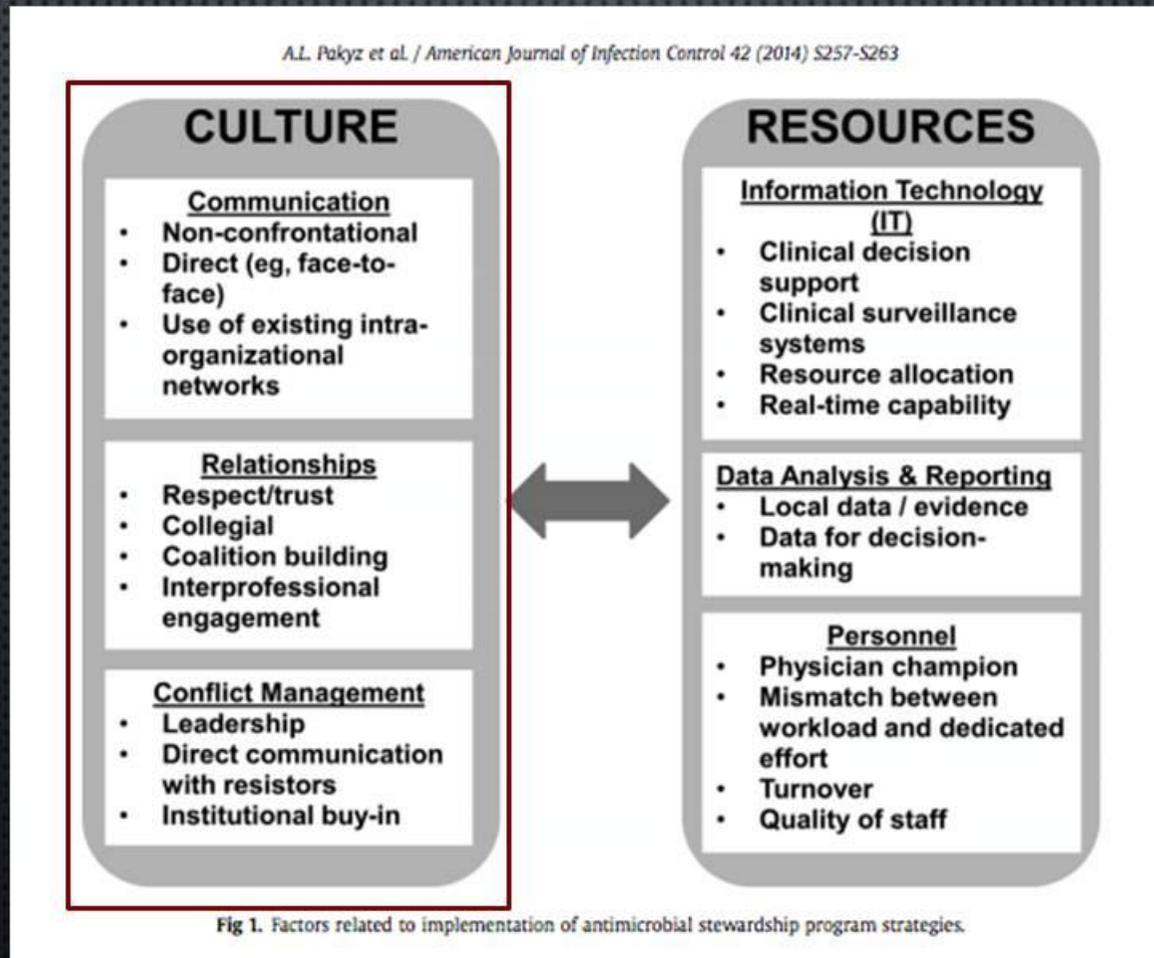
Table 1 A summary of the 73 implementation strategies, organized by cluster with mean importance and feasibility ratings

	Importance	Feasibility	Go-zone quadrant
Use evaluative and iterative strategies	4.19	4.01	-
4 Assess for readiness and identify barriers and facilitators	4.60	4.57	I
5 Audit and provide feedback	4.40	4.13	I
56 Purposefully reexamine the implementation	4.40	4.03	I
26 Develop and implement tools for quality monitoring	4.37	3.63	I
27 Develop and organize quality monitoring systems	4.33	3.37	I
23 Develop a formal implementation blueprint	4.30	4.47	I
18 Conduct local need assessment	4.27	4.33	I
61 Stage implementation scale up	3.97	3.77	I
46 Obtain and use patients/consumers and family feedback	3.67	3.80	I
14 Conduct cyclical small tests of change	3.63	4.03	I
Provide interactive assistance	3.67	3.29	-
33 Facilitation	4.13	3.77	I
54 Provide local technical assistance	3.97	3.20	IV
53 Provide clinical supervision	3.83	3.10	IV
8 Centralize technical assistance	2.73	3.10	III
Adapt and tailor to context	3.59	3.30	-

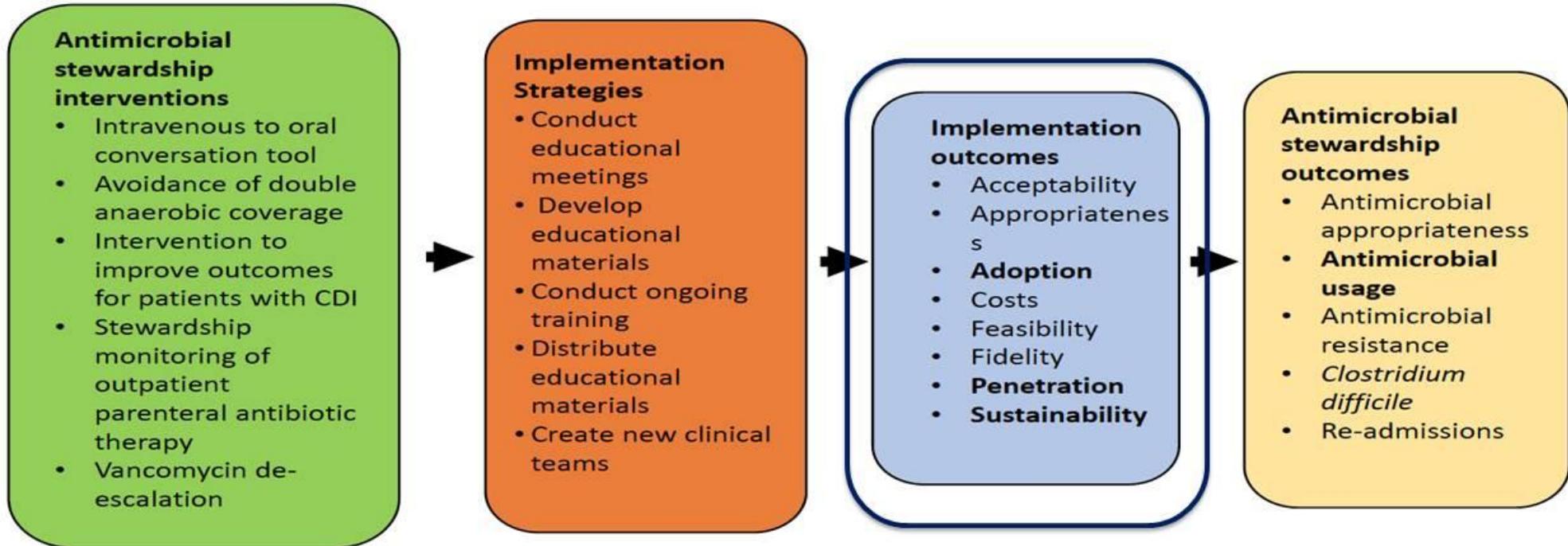
One size does NOT fit all.



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



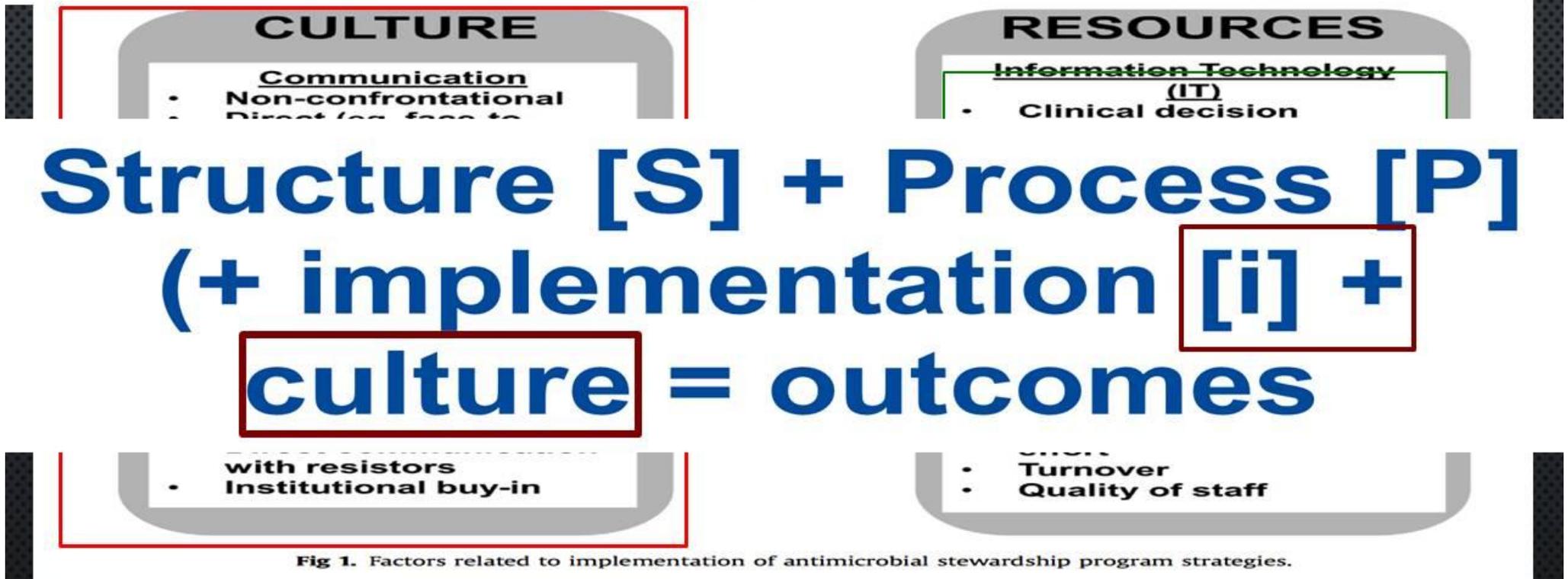
# VA Antimicrobial Stewardship Initiative



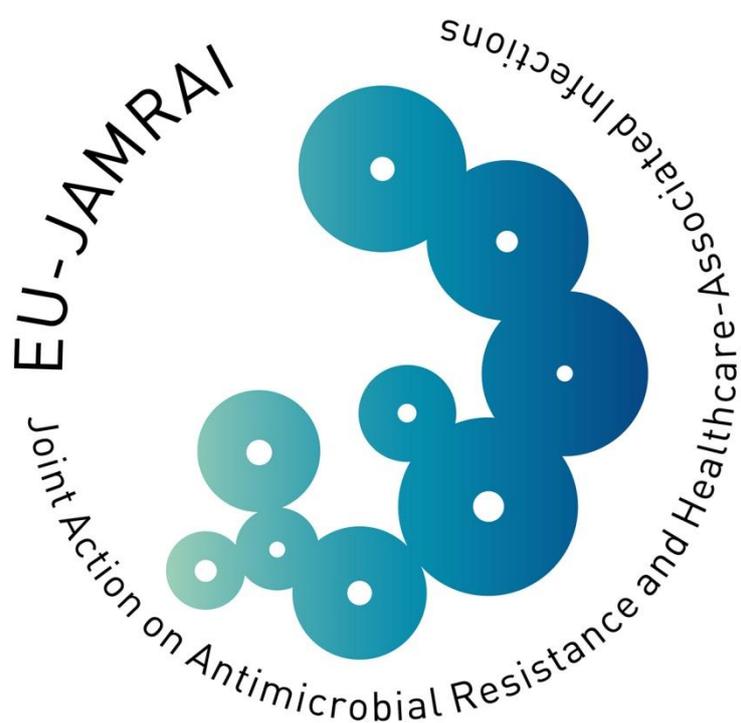
Chaudoir, Dugan, Barr, IS, 2013, 8:22; Kelly et al, ICHE, 2017

# 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



THANK YOU



*\* This document arises from the Joint Action on Antimicrobial Resistance and Healthcare-Associated Infections (EU-JAMRAI), which has received funding from the European Union, in the framework of the Health Program (2014-2020) under the Grant Agreement N°761296. Sole responsibility lies with the author and the Consumers, Health, Agriculture and Food Executive Agency is not responsible for any use that may be made of the information contained herein.*



Co-Funded by the  
Health Programme  
of the European Union