

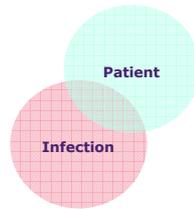
Changing behaviours in antimicrobial stewardship

Esmita Charani, MPharm, MSc
Academic Research Pharmacist, PhD Candidate
National Institute of Health Research Health Protection Unit
Imperial College London

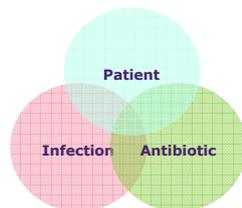
Context



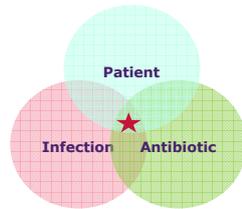
Context



Context

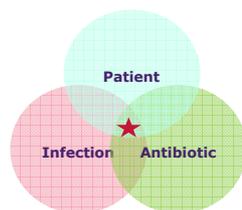


Context



Context

Society/Culture



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Antimicrobials: access and sustainable effectiveness

Published: November 18, 2015

Executive Summary

This Series examines the access and sustainable effectiveness of antimicrobials. The first two papers provide an insight into the mechanisms and drivers of antimicrobial resistance, its disease burden, and the potential effect of vaccines in restricting the need for antibiotics. The last three papers in the Series examine access and sustainability of antimicrobials at a more geographical level: reviewing access in low-income and middle-income countries; considering different policy domains and their effectiveness at national and regional levels to combat resistance; and identifying gaps in the current global effort to improve international collaboration and achieve key policy goals.



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Articles

Emergence of plasmid-mediated colistin resistance MCR-1 in animals and human beings in a molecular biological study

By 2050, infections could kill nearly ten million worldwide
 By [Michael Sainato](#) • 11/24/15 10:00am

[f](#) [t](#) [in](#) [g+](#) [e](#)

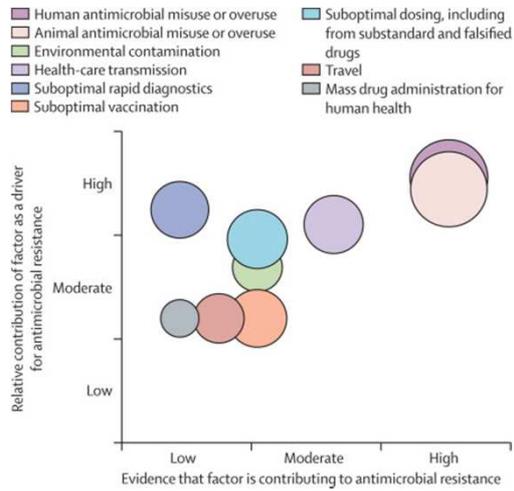


Yi-Yun Liu, BS[†], Yang Wang, PhD[†], Prof Timothy R Walsh, DSc, Ling-Xian Yi, Yohei Doi, MD, Guobao Tian, PhD, Baolei Dong, BS, Xianhui Huang, PhD, L BS, Xiaojie Chen, MS, Luchao Lv, MS, Dandan He, MS, Hongwei Zhou, PhD [ORCID](#), Prof Jianzhong Shen, PhD [ORCID](#)

[†] Contributed equally
 Published Online: 18 November 2015

[Altimetric](#) | 1,124

AMR is multifactorial

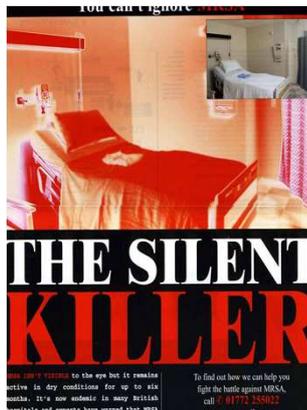


Holmes, Moore et al. Lancet. 2015; [Epub] Funders: NIHR

Influences on change

MRSA DEATHS DOUBLE IN FOUR YEARS

HOW OUR HOSPITALS ARE LOSING WAR ON SUPERBUGS



Hospital superbug crisis is a national disgrace

THE MRSA superbug crisis infecting Britain's hospitals is a national scandal. The government admits that as many as 100,000 patients a year fall victim to poor hygiene in the wards. Up to 5,000 of them die as a result, according to official estimates. But independent watchdogs say these figures are a decade out of date and that the true death toll could be as high as 30,000 a year.

Imperial College London

EAAD Prescriber's Checklist

Principles of safe antimicrobial use

Antibiotics – Misuse leads to antibiotic resistance

HANDLE WITH CARE! College Physicians

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

ANTIMICROBIAL STEWARDSHIP: "START SMART - THEN FOCUS"

Guidance for antimicrobial stewardship in hospitals (England)

Do not start antibiotics in the absence of evidence of infection

Have the appropriate cultures been collected before starting antibiotic therapy?

Do the culture results necessitate starting antibiotic therapy or modifying the current antibiotic therapy?

What is the optimal duration of antibiotic therapy for treating this type of infection in this patient?

What is the appropriate antibiotic dose for treating this kind of infection in this patient?

Does the choice of antibiotic therapy comply with your hospital's antibiotic guidelines and resistance patterns (antibiogram)?

Have you consulted your infectious disease physicians, microbiologists or pharmacists if appropriate?

EUROPEAN ANTIBIOTIC AWARENESS DAY

An EU initiative supported by the Department of Health

<http://www.rcplondon.ac.uk/About-the-college/collaboration/antibiotic-prescribing.aspx>

<http://www.rcplondon.ac.uk/About-the-college/collaboration/antibiotic-prescribing.aspx>

- 1) Antimicrobial management within the Trust-structures and lines of responsibility and accountability-high-level notification to the Board
- 2) Operational delivery of an antimicrobial strategy-operational standards of good antimicrobial stewardship
- 3) Risk assessment for antimicrobial chemotherapy
- 4) Clinical governance assurance
- 5) Education and training
- 6) Antimicrobial pharmacist systems in place for ensuring optimum use.
- 7) Patients, Carers and the Public-address information needs

J Antimicrob Chemother 2010; 65: 2669–2673
doi:10.1093/jac/dkq367 Advance Access publication 8 October 2010

Journal of Antimicrobial Chemotherapy

Antimicrobial stewardship: an evidence-based, antimicrobial self-assessment toolkit (ASAT) for acute hospitals

Jonathan Cooke^{1*}, Kelly Alexander², Esmita Charani³, Kieran Hand⁴, Tim Hills⁵, Philip Howard⁶, Conor Jamieson⁷, Wendy Lawson⁸, John Richardson⁹ and Paul Wade⁹

¹University Hospital of South Manchester NHS Foundation Trust and Manchester Academic Health Science Centre, Wythenshawe Hospital, Manchester M23 9EL, UK; ²Central Manchester University Hospitals NHS Foundation Trust, Manchester M13 9WL, UK; ³Imperial College Healthcare NHS Trust, London W12 0HS, UK; ⁴Southampton University Hospitals NHS Trust, Southampton SO16 6YD, UK; ⁵Nottingham University Hospitals, Derby Road, Nottingham NG7 2RN, UK; ⁶Leeds Teaching Hospitals NHS Trust, Leeds LS3 3EA, UK; ⁷Sandwell and West Birmingham NHS Trust, Birmingham B18 7QH, UK; ⁸Donford & Gravelthorpe NHS Trust, Donford DA2 8DA, UK; ⁹Bay's & St Thomas NHS Foundation Trust, London SE1 7EH, UK

Quality indicators

Board to Ward

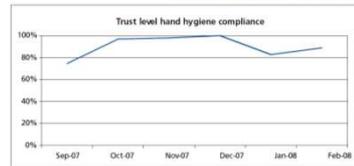
how to embed a culture of HCAI prevention in acute trusts



NHS

Department of Health

Numbers	Acceptable level	Sep-07	Oct-07	Nov-07	Dec-07	Jan-08	Feb-08
MRSA	as trajectory	5	2	2	1	0	1
Trajectory	12 p.a.	1	1	1	1	1	1
CDI	as trajectory	241	16	16	17	21	16
Trajectory	192 p.a.	16	18	20	25	20	20
HI compliance							
Central venous catheter	100%	60%	73%	75%	100%	100%	88%
Peripheral intravenous cannula	100%	100%	100%	96%	98%	100%	95%
Renal dialysis catheter	100%	0%	0%	100%	98%	96%	92%
Surgical site	100%	0%	32%	73%	86%	90%	100%
Ventilation	100%	100%	100%	100%	100%	100%	100%
Urinary catheter	100%	95%	96%	99%	100%	100%	100%
CDI	100%	70%	100%	100%	100%	95%	100%
Compliance							
MRSA screening	100%	75%	81%	83%	95%	100%	96%
Number of patients colonised	10c						
Decolonisation	100%	80%	85%	88%	100%	100%	100%
Antimicrobial prescribing	100%						
Isolation	100%	85%	100%	100%	100%	90%	100%
Hand hygiene	100%	75%	97%	98%	100%	83%	89%



theSource



Imperial College Healthcare NHS Trust

Imperial College Healthcare NHS Trust

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4 November 2011

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14 15 16 17 18 19 20
21 22 23 24 25 26 27
28 29 30 1 2 3 4
5 6 7 8 9 10 11

Clinical programme group intranet sites
CPG1
CPG2
CPG3
CPG4
CPG5
CPG6
CPG7

Public transport updates
Tube line status
Tube map
Journey planner

Messageboard highlights
Looking for accommodation? Go to the messageboard

UK health news
Access to this resource is currently unavailable

More...

Norovirus: be vigilant
Published: 01 November 2011
More...

Updated financial information

Search the source
Enter text here

Most commonly searched terms...

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outlook transport
pacc web outlook
annual leave leave
maintenance training availability
Reveal more terms...

Quick links
Major incident site
Submit an Intranet notice
Whooper timetable
DATIX incident reporting
Information for patients
Antibiotic/antimicrobial policy
Outofhours access to medicines
Transport of Pathology Specimens
Order eProcurement ordering
Medical Equipment Inventory
Safeguarding Children and young people
Synbiotics tool
Shares injury reporting
Major team/manager protocol
GP practice
Quick links gone? Its here

New mortality data shows Trust has one of lowest rates in country
Published: 31 October 2011
More...

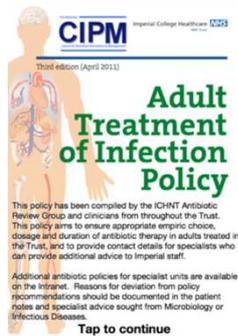
Open Hour October 2011: what you said
Published: 26 October 2011
More...

Read all about it in media round-up
Published: 19 October 2011
More...

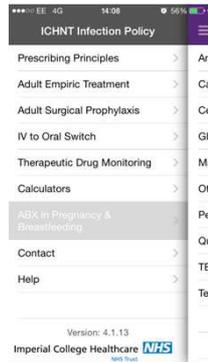
More Trust news

InBrief- courses and lectures
The professional administrator
Service excellence whilst professionally managing the administrative

..from paper pocket guide....



...to smartphone app



... to boundary object



What the users told us:



84% Increased knowledge

95% Influenced prescribing

Imperial College London

Delivering antimicrobial stewardship through a bespoke mobile-health application REAIM analysis of the three year impact.

Luke SP Moore^{1,2}, Esmita Charani^{1,2}, Enrique Castro-Sanchez^{1,2}, Myriam Gharbi¹, Mark J Gilchrist^{1,2}, Alison H Holmes¹.

¹NH&M Health Protection Research Unit in Antimicrobial Resistance and Healthcare Associated Infection, Imperial College London (UK) ²Imperial College Healthcare NHS Trust, London (UK)

Introduction

The widespread use of smartphones in both low & middle income, and high income, countries has led to an exponential growth in mobile-health (mHealth) devices and software.¹ Increasingly smartphone and tablet applications (Apps) are being developed targeting healthcare users and providers. In the field of antimicrobial stewardship, where paper based policies to optimise antimicrobial prescribing practices frequently exist, but where large implementation gaps remain, mHealth is being increasingly used to bring policies to the point of care and change behaviour.²

However the impact of mHealth Apps on antimicrobial prescribing and stewardship is unclear, yet needs urgent clarification before wider adoption can be advocated. At a multisite hospital network with 1300 beds serving a population approaching 2 million in West London, we developed an mHealth App to deliver the local antimicrobial prescribing policy across our hospitals to frontline healthcare staff. This product was launched in August 2011 (Figure 1).³

We report here a pragmatic, mixed quantitative and qualitative observational study analysing the long-term impact and sustainability of the Imperial Antimicrobial Prescribing Policy application (IAPP) 3 years after roll out, to inform the debate on the utility of mHealth Apps for antimicrobial stewardship.

References

- Mosa AS et al. A systematic review of healthcare applications for smartphones. *BMC Med Inform Decis Mak.* 2012;12:67.
- Gurman TA et al. Effectiveness of mHealth behaviour change communication interventions in developing countries: a systematic review of the literature. *J Health Commun.* 2012;17(5):82-104.
- Charani E et al. An analysis of the development and implementation of a smartphone application for the delivery of antimicrobial prescribing policy: The lessons learnt. *J Antimicrob Chemother.* 2013;68(4):960-7.
- Glasgow RE et al. The future of health behavior change research: what is needed to improve translation of research into health promotion.

Methods

Retrospective analysis of the impact of IAPP on practice & stewardship was undertaken using the established REAIM mixed methods approach (reach, effectiveness, adoption, implementation and maintenance). This framework was developed by Glasgow and colleagues⁴ to enable evaluation & reporting of interventions targeting behaviour change.

Quantitative data from IAPP analytics were used to investigate reach, adoption and maintenance. Qualitative structured surveys administered to (i) 43 junior doctor end users and (ii) a multidisciplinary panel of 8 infection experts with oversight of the hospital network antimicrobial stewardship programme, were used to investigate effectiveness and implementation.

Results

Reach: 3086 new users were registered during the three years, with the hospital network employing 1100 junior doctors on rotation, and 110 pharmacists at any one time (mean per annum; Figure 2). There was additional unintended reach, with IAPP diffusion extending beyond West London; 2934 of new users were identified as downloading the IAPP in the UK, but 79 users came from across continental Europe and 73 from outside of Europe (all areas of the globe except Central America).

Adoption: 105,281 IAPP consults were recorded in the first 3 years following launch with 316 active users per month (median; Figure 2). 58% of IAPP users accessed it 2 or more times per day, and 25-35% of users consistently accessed it >10 times per month (Figure 3). The median session duration was 1-3 minutes. 42% of all IAPP usage occurred outside of normal working hours (5pm to 9am).

Implementation: 47% of the 43 junior doctors surveyed stated introduction of the IAPP into their practice was achieved during face-to-face teaching sessions but peer-to-peer advocacy also engendered use (30%) (email, intranet and senior advocacy constituted the remaining paths). Utilisation of the IAPP was reportedly engendered by its accessibility (92%), ease of use (84%), up-to-dateness (55%) and the provision of customised dosing information (24%).

Maintenance: Only 9.3% of 3086 users accessed the IAPP for a single session, with high user retention at 1 and 3 months (Figure 3a). There was a persistent tendency for late-switchers for versions 1-4 of the IAPP. A change to push notifications for version 5 obviated this and produced near ubiquitous adoption of the newest version (Figure 3b).

Effectiveness: All 8 of the institute expert panel agreed the IAPP had influenced prescribing patterns, making a positive contribution to stewardship. 5/8 considered the IAPP may have had a greater effect on local antimicrobial prescribing than the contemporaneous national campaigns. Among the 43 junior doctors surveyed, 62% stated the IAPP improved their knowledge of antimicrobial prescribing and 85% felt it improved their

Results

Three years after implementation demonstrated wide access as effectively achieved widespread maintenance. App junior doctors actively accessed it 2 or more times per day, and over half of the day.

The short time in minutes) is indicating users pursuing specific advice, and likely not trees developed, supported by the implementation.

A high proportion of off-hours when resources (such as pharmacists) are in position that the IAPP

The persistence of 4 year's doctor intake versions of the App ongoing communication reach and adoption paper-based policies date IAPP versions push-notifications available with paper

Face-to-face implementation utilisation of peer-wide reach, rapid adoption the IAPP which is prescribing practice

This study provides advocacy of use antimicrobial steward objective quantitative effectiveness of 10 context of what are stewardship interven

CE1

How can we measure impact?

Pan-network biannual point prevalence study

Choice of antibiotic in line with policy

Indication documented in medication chart

Stop/review date documented in medication chart

IAPP Launch
Audit and feedback intervention in medicine
National Guidance - SSTF

Diapositive 20

CE1 If we know the start date of the pharmacy led antibiotic ward rounds we should add this to the graph

I have not added the IAPP updates as it will get too messy

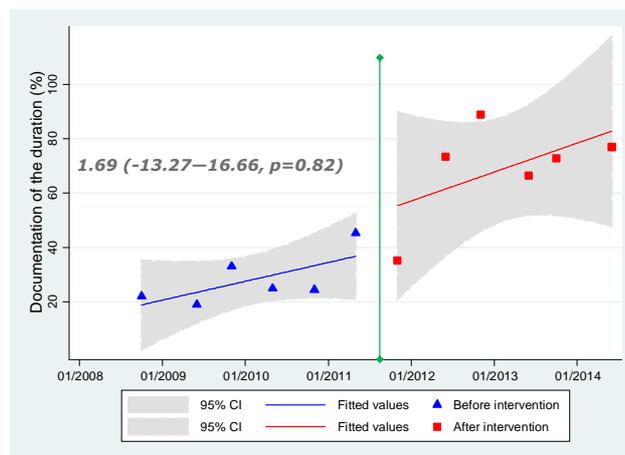
Any suggestions for what other interventions need to be added to the graph?

Charani, Esmita; 14/04/2015

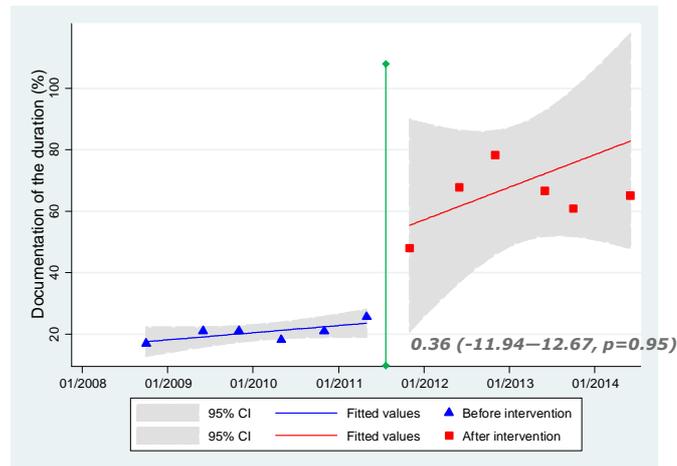
Study Design: retrospective ITS

- ❑ Six monthly PPS data
- ❑ Four separate versions of the IAPP over time
- ❑ At least three data points pre and post defined intervention
- ❑ An estimation of intervention effect
- ❑ Time series regression
- ❑ Medicine and surgery specialties analyzed separately

Medicine – Stop/review date documented



Surgery – Stop/review date documented



Interventions to improve antibiotic prescribing practices for hospital inpatients (Review)

Davey P, Brown E, Charazi E, Foadon L, Gould IM, Holmes A, Ramsay CR, Wiffen PJ, Wilson M



This is a register of Cochrane reviews, prepared and maintained by The Cochrane Collaboration and published in The Cochrane Library 2013, Issue 5

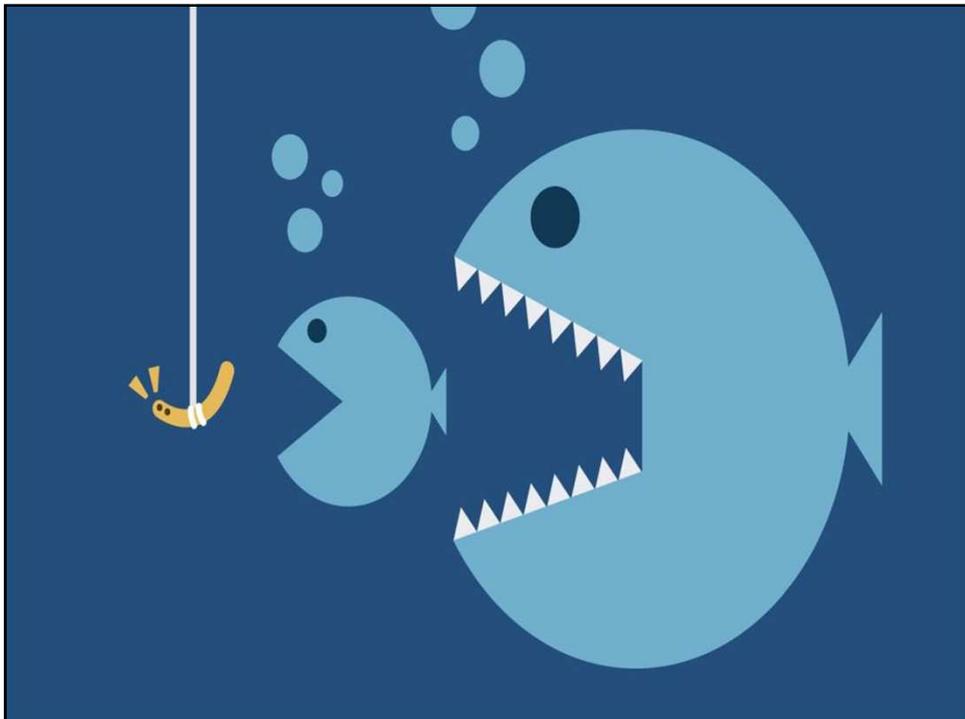
WILEY

Interventions to improve antibiotic prescribing practices for hospital inpatients (Review)
Copyright © 2013 The Cochrane Collaboration. Published by John Wiley & Sons, Ltd

The results show that interventions to reduce excessive antibiotic prescribing to hospital inpatients can reduce antimicrobial resistance or hospital-acquired infections, and interventions to increase effective prescribing can improve clinical outcome. This update provides more evidence about unintended clinical consequences of interventions and about the effect of interventions to reduce exposure of patients to antibiotics. The meta-analysis supports the use of restrictive interventions when the need is urgent, but suggests that persuasive and restrictive interventions are equally effective after six months.



Why is culture important?



Mindlines vs Guidelines Gabbay et al BMJ 2004 Oct 30; 329(7473): 1013

- ❑ Clinicians rarely used explicit guidelines
- ❑ Internalised tacit guidelines
- ❑ Socially constructed knowledge
- ❑ Mindlines aka culture?



Measurement is a Social Process



Lining Up: How is harm measured?

Lessons from an ethnographic research study
of interventions to reduce central line infections



Learning report
February 2013

Antimicrobial stewardship: are we failing in cross-specialty clinical engagement?

Timothy M. Rawson^{1,2*}, Luke S. P. Moore^{1,2}, Mark J. Gilchrist¹ and Alison H. Holmes^{1,2}



Figure 3. AMS- and/or AMR-related abstracts from UK and international state-of-the-art clinical scientific conferences in 2014. *UK significantly greater than international conferences ($P < 0.05$). #International significantly greater than UK conferences ($P < 0.05$). Risk score: H=high, M=medium and L=low (calculated from the ECDC pilot point-prevalence survey of HCAI and AU data¹¹). n/a, not available.

MAJOR ARTICLE

Behavior Change Strategies to Influence Antimicrobial Prescribing in Acute Care: A Systematic Review

Esmat Charani,¹ Rachel Edwards,¹ Nick Sevdalis,² Bar Bryony Dean Franklin,^{3,4} and Alison Holmes¹

¹The National Centre for Infection Prevention and Management, ²Dept Imperial College London, ³Independent Consultant, ⁴For Foster Institute Healthcare National Health Service Trust, and ⁵The School of Pharmacy United Kingdom

Background. Antimicrobial use in acute care is a major contributing factor to the emergence of antimicrobial resistance. Addressing prescribing behavior is a key component of antimicrobial stewardship programs. We performed a novel systematic review of antimicrobial prescribing behavior in acute care. We used a combination of search strategies and marketing were used and whether this could be related to the Cochrane Library, PsycInfo, Databases Management Information Consortium (EMIC) were 1999–April 2011 and published in English.

Results. Five qualitative and 5 quantitative studies reported the influence of social norms, attitudes, and studies reporting interventions to optimize antimicrobial prescribing behavior in acute care.

Conclusions. Despite qualitative evidence demonstrating the influence of social norms on prescribing, these influences are not well understood. To ensure a better understanding of prescribing behavior in acute care, the incorporation of a multidisciplinary collaboration is recommended.

Understanding the Determinants of Antimicrobial Prescribing Within Hospitals: The Role of “Prescribing Etiquette”

E. Charani,¹ E. Castro-Sanchez,¹ N. Sevdalis,^{2,3} V. Kyriaki,¹ L. Drumright,¹ N. Shah,¹ and A. Holmes¹

¹The National Centre for Infection Prevention and Management, Mertoninb Hospital, and ²Department of Surgery and Cancer, and ³Imperial Centre for Patient Safety and Service Quality, St Mary's Hospital, Imperial College London, United Kingdom

Background. There is limited knowledge of the key determinants of antimicrobial prescribing behavior (APB) in hospitals. An understanding of these determinants is required for the successful design, adoption, and implementation of quality improvement interventions in antimicrobial stewardship programs.

Methods. Qualitative semistructured interviews were conducted with doctors (n = 10), pharmacists (n = 10), and nurses and midwives (n = 19) in 4 hospitals in London. Interviews were conducted until thematic saturation was reached. Thematic analysis was applied to the data to identify the key determinants of antimicrobial prescribing behavior.

Results. The APB of healthcare professionals is governed by a set of cultural rules. Antimicrobial prescribing is performed in an environment where the behavior of clinical leaders or seniors influences practice of junior doctors. Senior doctors consider themselves exempt from following policy and practice within a culture of perceived autonomous decision making that relies more on personal knowledge and experience than formal policy. Prescribers identify with the clinical groups in which they work and adjust their APB according to the prevailing practice within these groups. A culture of “noninterference” in the antimicrobial prescribing practice of peers prevents intervention into prescribing of colleagues. These sets of cultural rules demonstrate the existence of a “prescribing etiquette,” which dominates the APB of healthcare professionals. Prescribing etiquette creates an environment in which professional hierarchy and clinical groups act as key determinants of APB.

Conclusions. To influence the antimicrobial prescribing of individual healthcare professionals, interventions need to address prescribing etiquette and use clinical leadership within existing clinical groups to influence practice.

Keywords. prescribing etiquette; antimicrobial prescribing; prescribing behavior.

MAJOR ARTICLE

RESEARCH

Open Access



An antimicrobial stewardship program initiative: a qualitative study on prescribing practices among hospital doctors

Brita Skodvin^{1*}, Karina Aase², Esmita Charani³, Alison Holmes³ and Ingrid Smith¹



Review

Time for action—Improving the design and reporting of behaviour change interventions for antimicrobial stewardship in hospitals: Early findings from a systematic review

Peter Davey^{a,*}, Claire Peden^a, Esmita Charani^b, Charis Marwick^a, Susan Michie^c

^a Division of Population Health Sciences, Medical Research Institute, University of Dundee, Dundee DD2 49Y, Scotland, UK

^b Centre for Infection Prevention and Management, Imperial College, Hammersmith Campus, London W12 0BN, UK

^c Centre for Behaviour Change, University College London, 7-75T Tavistock Place, London WC1E 7HA, UK

Ongoing research – Qualitative research into the determinants and delivery of antimicrobial stewardship across an NHS Trust

- Ethnography research into antimicrobial prescribing behaviours in different teams
 - Medical, Surgical, ICU
 - Over 70 hours of observational data
 - 400 individual patient consultations
 - The impact of decision support tools, electronic prescribing, and team work
 - Face to face semi-structured qualitative interviews with teams
 - Analysis of the impact of above on prescribing behaviours using a tracer illness

Ongoing research – Qualitative research into the determinants and delivery of antimicrobial stewardship across an NHS Trust

- Implementation of antimicrobial prescribing stewardship across the trust
 - IP&C, Microbiology, Infectious Diseases, Pharmacy
 - An appraisal of current initiatives
 - Mapping of all interventions
 - Developing a road map for implementation of antimicrobial stewardship across a multisite NHS Trust
 - To include qualitative research
 - Describing the context
 - Identifying the strengths and weaknesses
 - Engaging with key stakeholders

Ongoing research – International perspective

- Implementation of antimicrobial prescribing stewardship in different healthcare settings
 - Norway – three hospitals
 - How antimicrobial stewardship is delivered
 - At the beginning of the stewardship journey
 - France
 - Different stakeholder dynamics
 - What lessons we can learn from above and implement in the NHS

<https://www.futurelearn.com/courses/antimicrobial-stewardship>

The screenshot shows the top section of a FutureLearn course page. At the top left is the FutureLearn logo. In the center, there are navigation links for 'Courses', 'About', and 'Partners'. On the top right, there is a 'Sign in' button. The main banner features a background image of green and red microorganisms. The text on the banner reads: 'FREE ONLINE COURSE', 'Antimicrobial Stewardship: Managing Antibiotic Resistance', and 'Understand antibiotic resistance, and how antimicrobial stewardship can slow down or reduce it, with this free online course'. A pink button at the bottom of the banner says 'Join now - starts 8 Feb'.



FREE online course

Ongoing research – International perspective

- MOOC – taking the research to an international audience
 - Over 5000 learners worldwide
 - Week 5: dedicated week to behaviour change
 - 920 learners
 - 445 completed survey on (55% of learners)
 - Favourite week was week five!
 - Recognition of need to integrate behaviour change research
 - FCO project with BSAC – AMS in India

Imperial HPRU in AMR and HCAI, in collaboration with the Health Foundation and BSAC



Thank you! I leave you with some of the comments from the MOOC learners...

'Culture must never be underestimated.'

'It is interesting that although culture plays such an important part in AMS we don't focus efforts on changing it as much as we should. Hierarchy can be a huge barrier to implementing change.'

'You are absolutely correct, Culture plays significant role in antibiotics prescription...even here in our society in South Sudan community prefer injectables more than oral and the reason behind this move is in unknown. I agree with you. I'm a pharmacist by profession and we faced the same situation in our country as well other society did the them. Thank you for your lecture.'

Acknowledgements

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and Antimicrobial Resistance

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Imperial College Healthcare 
NHS Trust

*Mark Gilchrist
Darren Nelson
Eimear
Brannigan*


**National Institute for
Health Research**

 **HELSE BERGEN**
Haukeland universitetssjukehus

*Stig Harthug
Ingrid Smith
Brita Skodvin*

*Nick Sevdalis
Carolyn Tarrant*

 @e_charani