



Better hospitals through
better research

HARC Scholarship Report

Modifying antibiotic prescribing behaviours:

exploring innovative antimicrobial stewardship interventions and
the science behind their success

Kate Callaghan

Project Officer, Antimicrobial Stewardship

Clinical Excellence Commission

April, 2016

Acknowledgements

I would like to express my sincere gratitude to the following organisations for their generosity in hosting me during my international study tour. The advice and mentorship of all staff involved has been immensely valuable in the pursuit of my project goals.

- Scottish Antimicrobial Prescribing Group, Scottish Medicines Consortium, Glasgow UK
- Gartnavel General Hospital (NHS Greater Glasgow & Clyde), Glasgow UK
- Western General Hospital (NHS Lothian), Edinburgh UK
- NHS Education for Scotland, Edinburgh UK
- Public Health England and NHS Health Education England, London UK
- Imperial College, London UK
- Hammersmith Hospital (Imperial College Healthcare NHS Trust), London UK
- Behavioural Insights Team, London UK

I would like to thank the Hospitals Alliance for Research Collaboration (HARC) Scholarship Program, without which this valuable research would never have been undertaken. I would also like to give special mention to NSW Clinical Excellence Commission staff Ms Evette Buono and Dr Paul Curtis, who have consistently encouraged and supported my endeavours as a HARC Scholarship recipient.

Table of Contents

Acknowledgements	2
1. Executive Summary & Recommendations	4
2. Literature Review	8
3. HARC Scholarship Study Tour	13
3.1 Conference Attendance – ICPIC 2015	13
3.2 International Visits	19
<i>Glasgow, UK</i>	19
<i>Edinburgh, UK</i>	22
<i>London, UK</i>	24
4. References	29

1. Executive Summary & Recommendations

Antimicrobial stewardship involves a coordinated and ongoing organisational effort to optimise antibiotic use, with a goal to improve patient outcomes and reduce adverse consequences such as toxicity, unnecessary cost and antimicrobial resistance.¹ In 2012, antimicrobial stewardship became a standalone criterion within Standard 3 of the National Safety & Quality Health Service standards, meaning Australian hospitals must demonstrate that a sustainable antimicrobial stewardship program is in place and that action is taken to improve its effectiveness over time.²

The Clinical Excellence Commission (CEC) Quality Use of Antimicrobials in Healthcare (QUAH) program was established in 2012 to provide advice and resources to support NSW public hospitals developing and enhancing their antimicrobial stewardship programs. Feedback received by the QUAH program team has often emphasised that development and implementation of interventions is challenging, and that persuasive interventions (such as prescriber education, provision of clinical guidelines, use of audit and feedback methods) often produce results of only incremental success with a highly variable duration of effect. These types of interventions are usually quite labour-intensive for front-line health professionals, and many NSW public hospitals lack key resources (e.g. clinical expertise, dedicated personnel time and financial support) to implement them in a sustainable way. As persuasive interventions are considered essential strategies for optimising antibiotic use in the acute hospital setting,^{1,3} ongoing efforts seek to maximise the effectiveness and sustainability of these initiatives, with a growing body of evidence that an understanding of behavioural science may be the key to making further gains.^{4,5}

When evaluating the impact of persuasive interventions it has become increasingly clear that many of the perceived barriers to improved antimicrobial use are not being adequately recognised or managed within the design and implementation of stewardship initiatives.⁶ Many of these barriers are much more complex than a simple knowledge deficit; rather, they are inextricably linked to the cultural, social and political factors inherent to the acute hospital environment.^{5,7} A greater understanding of behavioural science and theory (and how this can be integrated into the design of targeted interventions) stands to offer considerable benefit not only in the context of antimicrobial stewardship, but across a wide range of clinical improvement and professional development programs in healthcare quality and safety organisations.

This report discusses the key learnings and recommendations of a research project investigating innovative antimicrobial stewardship interventions, with a particular focus on the modification of antimicrobial prescribing behaviours. Receipt of a Hospitals Alliance for Research Collaboration (HARC) Scholarship provided the financial support for an international study tour; including attendance at a conference in Geneva and visits with a range of subject-matter experts at various centres of excellence throughout the United Kingdom. A project timeline and list of final recommendations have been provided below.

Project Timeline

Feb – Mar 2015	Construction of research proposal and project plan
31 Mar 2015	Notification of receipt of HARC Scholarship
Apr – May 2015	Literature review performed and study tour planned
16 Jun – 8 Jul 2015	<p>International study tour completed, including:</p> <ul style="list-style-type: none"> • Attendance at ICPIIC Conference (Geneva, Switzerland) • Visits with the Scottish Antimicrobial Prescribing Group, Health Protection Scotland and NHS Education for Scotland (Glasgow and Edinburgh, UK) • Visits with Public Health England and NHS Health Education England, Imperial College London and Behavioural Insights Team UK (London, UK) • Visits to Gartnavel General Hospital (Glasgow), Western General Hospital (Edinburgh) and Hammersmith Hospital (London).
Sep 2015 – Apr 2016	Post-tour review and follow-up, ongoing literature scanning and write-up of final report

Recommendations

Recommendation 1: *Use evidence from social and behavioural science research to more effectively market antimicrobial stewardship messages and interventions to the target audience, and impart these insights to frontline health staff working in NSW antimicrobial stewardship programs.*

- Changes in the way antimicrobial stewardship messages are constructed have the potential to significantly improve the extent to which these messages result in behaviour change. For example, current prescriber messaging around the impact of antimicrobial resistance often has a strong focus on the potentially catastrophic global impact of this phenomenon. A more effective approach, (informed by our understanding of prescriber influences such as medical benevolence, fear-based biases, present bias and the 'identifiable-victim effect'), might be to focus that messaging on the impact of antimicrobial prescribing decisions on the well-being of the *individual patient* who requires treatment *in the here and now*. For example, messages might emphasise long-term disruption of the protective microbiome from even a single dose or course of antibiotics, the increased risk of a patient developing or acquiring resistant organisms as a result of antibiotic use, and the general risk of adverse reactions and complications when taking medication.
- Staff with responsibilities for antimicrobial stewardship would gain significant benefit from being taught about tools such as the EAST framework for interventional design (Behavioural Insights Team UK), targeted negotiation and engagement techniques, and how to account for the social, cultural, political and cognitive factors which influence a prescriber's day-to-day decision-making.

Recommendation 2: *Continue development and dissemination of antimicrobial stewardship quality improvement projects such as the 5x5 Antimicrobial Audit, with renewed emphasis on maximising the impact of the audit, intervention and feedback methodology.*

- Quality improvement projects which deliberately incorporate evidence-based behavioural change methodologies are more likely to be effective, however to achieve long-term success these interventions must be shaped into a practical model that is easy to implement and sustain. Support should be provided to ensure implementation teams understand which components of the methodology are most critical, and how seemingly small changes can be made to optimise the effectiveness of their interventions.
- Over the past 24 months the 5x5 Antimicrobial Audit has been developed into a comprehensive resource package which includes substantive guidance on maximising the impact of the audit, intervention and feedback methodology. Recent efforts have been made to provide further advice and training on how interventions should be made (e.g. introductory techniques, phrasing of recommendations, timing and form of enquiry) and how feedback should be provided (e.g. how many times, in what form and by whom). The evaluation of the 12 month pilot project also provides advice on 'key determinants of success', based on observations around which pilot sites demonstrated the most improvement over time.

Recommendation 3: *Focus on interventions which build relationships of inter- and intra-disciplinary support, and which break down cultural, social and political barriers to appropriate antibiotic prescribing.*

- Efforts need to be made within individual facilities and healthcare units to deconstruct some of the hierarchical and 'prescribing etiquette' barriers which have been shown to stifle important discussions about antimicrobial practice. The vast majority of antimicrobial prescriptions in hospitals are written by junior doctors, however it is the senior-level clinicians who are providing either direct instruction or bearing indirect influence over antimicrobial decision-making. Due to a strong perception of disempowerment amongst junior prescribers, the engagement of senior clinicians is absolutely critical in attempting to change antimicrobial prescribing practice.
- Beyond simply providing feedback on their antimicrobial use, senior prescribers should receive advice and/or training which may help to deconstruct barriers to appropriate prescribing. Topics might include common cognitive biases/fallacies which are known to interfere with objective antimicrobial decision-making (and/or lead to diagnostic error), exercises in defining what constitutes acceptable or unacceptable levels of uncertainty in managing infectious disease states, and understanding power-distance relationships within medical teams and its implications for effectiveness and safety.
- Healthcare organisations should maximise access to infectious diseases and microbiological guidance and expertise, whilst simultaneously addressing the cultural and social barriers which might stop a prescriber from choosing to access this support. For example, the idea that prescribing therapy for a common infectious condition is 'easy' and 'something that any doctor

should be able to do without help' should be vastly refuted. A cultural shift towards recognising the inherent and ever-increasing complexity of antimicrobial prescribing (e.g. 'at no point in the history of healthcare has antimicrobial prescribing been more difficult and complex as it is today') becomes an enabler for prescribers to recognise their potential to err and as such lowers the threshold at which they will choose to access supportive resources.

- Whilst pharmacists may be an obvious choice for leading antimicrobial stewardship teams and projects, there are a great many facilities within NSW Health which do not have a portion of pharmacists' time dedicated to antimicrobial stewardship, and some do not have an on-site pharmacy service. Engaging and supporting nursing staff as antimicrobial stewardship leads remains challenging, however programs in the UK and other countries have had significant success in employing antimicrobial stewardship nurses and crafting a recognised and valued skillset within these roles.

Recommendation 4: *Investigate and support development and use of mobile app technology as a tool to improve access to guidelines, clinical decision-making and data collection within the context of antimicrobial stewardship.*

- Mobile apps have been used in a variety of ways to improve accessibility of information and educational engagement across many facets of healthcare. Although it may be difficult to measure the extent to which this has resulted in sustainable changes in prescribing behaviours, these apps often have high rates of uptake and ongoing use amongst hospital clinicians (especially junior doctors), and feedback supports mobile apps as a preferred method of providing point-of-care prescribing advice and support.
- Mobile apps are likely to be most effective if designed with input from human factors experts and if they offer more than simple static information (i.e. if they include decision support tools, risk calculators and alerts or updates). As an educational tool, mobile technology also lends itself well to incentivisation, gamification and spaced-learning – user-engagement and motivation concepts which can be used to improve information retention and understanding in a healthcare environment.
- Although the Clinical Excellence Commission does not have current plans to develop an antimicrobial stewardship-related mobile app, the organisation should promote and support the discussion of new and established mobile technologies which have been developed and or implemented either locally or internationally.

2. Literature Review

The literature review phase of this project involved searching for and analysing evidence from existing research on two key topics: antimicrobial stewardship interventions and healthcare worker behaviours. Resources which provided commentary across both of these topics were prioritised, as were landmark papers such as Cochrane reviews. A wide variety of key words and databases were used, with a strong focus on the relative recency and quality of publication. The most relevant findings have been summarised in the table below.

PUBLICATION	OBJECTIVE	METHODS	RELEVANT FINDINGS/CONCLUSION
<p>Behaviour change and antibiotic prescribing in healthcare settings: Literature review and behavioural analysis</p> <p>Conjoint publication from Public Health England and Department of Health (England), February 2015</p> <p>Authors: Dr Richard Pinder, Anna Sallis, Dan Berry, Dr Tim Chadborn</p>	<p>To compile and comprehensively review evidence around antibiotic prescribing and usage behaviours across patient, primary care and secondary care domains.</p>	<p>The methodology consisted of a literature review, consultation with stakeholders, mapping of behavioural and decision-making pathways, and a series of behavioural analyses using a 'theoretical domains framework' (TDF).</p>	<ul style="list-style-type: none"> • Clinical guidelines are seen as a route to improve clinical decision-making. They should be developed by healthcare professionals and be 'tailored and sensitive to clinical needs'. It remains unclear why some guidelines work (to improve practice) and others do not. • Whilst much of the existing prescribing education is targeted at junior prescribers (due to their heavy burden of day-to-day inpatient prescribing), real or perceived hierarchical expectations of senior doctors' preferences and habits are hugely influential. • Hospital inpatients are often higher acuity (relative to outpatients and primary care), which has the effect of downscaling the salience of concerns about antibiotic choices contributing to antimicrobial resistance • Whilst peer influence is a strong factor in determining prescribing behaviours, 'prescribing etiquette' is a complex social dynamic where respect for another clinician's clinical autonomy and judgement limits the potential for self-regulation within professional groups. • The analysis and recommendations contained in this publication are given within a UK frame of reference, however most points are generalisable to an Australian context due to key structural and cultural similarities between the UK and Australian public hospital systems.

PUBLICATION	OBJECTIVE	METHODS	RELEVANT FINDINGS/CONCLUSION
<p>Interventions to improve antibiotic prescribing practices for hospital inpatients (Review)</p> <p>Published by The Cochrane Collaboration, 2013.</p> <p>Authors: Peter Davey, Erwin Brown, Esmita Charani, Lynda Fenelon, Ian M Gould, Alison Holmes, Craig R Ramsay, Philip J Wiffen, Mark Wilcox</p>	<p>“To estimate the effectiveness of professional interventions that, alone or in combination, are effective in antibiotic stewardship for hospital inpatients, to evaluate the impact of these interventions on reducing the incidence of antimicrobial-resistant pathogens or Clostridium difficile infection and their impact on clinical outcome.”</p>	<p>Identification and examination of 89 studies reporting on 95 interventions across 19 countries. Studies had to meet defined standards for methodological rigour and interpretable data to be included in the review. Analyses to compare the effects of persuasive versus restrictive interventions involved meta-regression of interrupted time series studies.</p>	<ul style="list-style-type: none"> • Key comparisons were drawn between persuasive and restrictive methods – persuasive methods advise and guide clinicians, whereas restrictive methods involved limitations being placed on prescribing via criteria-based processes and/or permissions. • Both persuasive and restrictive interventions demonstrated significant potential to improve prescribing practices, however success was variable. • Restrictive methods were found to be more likely to have an immediate and obvious impact, however the degree of impact was found to be similar between restrictive and persuasive methods after 6 months.
<p>Audit and feedback: effects on professional practice and healthcare outcomes (Review)</p> <p>Published by The Cochrane Collaboration, 2012.</p> <p>Authors: Noah Ivers, Gro Jamtvedt, Signe Flottorp, Jane M Young, Jan Odgaard-Jensen, Simon D French, Mary Ann O’Brien, Marit Johansen, Jeremy Grimshaw, Andrew D Oxman</p>	<p>“To assess the effects of audit and feedback on the practice of healthcare professionals and patient outcomes and to examine factors that may explain variation in the effectiveness of audit and feedback.”</p>	<p>Identification and examination of 140 studies which included audit and feedback interventions involving objectively measured health professional practice or patient outcomes. Median effect sizes were analysed and a variety of factors were investigated as possible explanations for effectiveness variation (including feedback source, format and frequency, baseline performance, profession and instructions for improvement). The role of context and the targeted clinical behaviour was also considered.</p>	<ul style="list-style-type: none"> • Audit and feedback methods generally lead to ‘small but potentially important’ improvements in professional practice. (The range-of-effect found ranged from little to no effect, to a substantial effect.) • Effectiveness of feedback is influenced by a range of (often modifiable) factors. Audit and feedback methods may be most effective when: <ol style="list-style-type: none"> 1. Baseline performance is poor (i.e. room for improvement) 2. The person responsible for audit and feedback is a supervisor or colleague 3. Feedback is provided more than once 4. Feedback is given both verbally and in writing 5. Feedback includes clear targets and an action plan.

PUBLICATION	OBJECTIVE	METHODS	RELEVANT FINDINGS/CONCLUSION
<p>Printed educational materials: effects on professional practice and healthcare outcomes (Review)</p> <p>Published by The Cochrane Collaboration, 2012.</p> <p>Authors: Anik Giguère, France Légaré, Jeremy Grimshaw, Stéphane Turcotte, Michelle Fiander, Agnes Grudniewicz, Sun Makosso-Kallyth, Fredric M Wolf, Anna P Farmer, Marie-Pierre Gagnon</p>	<p>“To assess the effect of printed educational materials on the practice of healthcare professionals and patient health outcomes, and explore the influence of some of the characteristics of the printed educational materials (e.g. source, content, format).”</p>	<p>Identification and examination of 45 studies (randomised controlled trials and interrupted time series), which were evaluated based on the impact of printed educational materials on either/both healthcare professionals’ practice or patient outcomes.</p>	<ul style="list-style-type: none"> • Interventions using printed educational materials are often implemented with a goal to improve healthcare professionals’ awareness, knowledge, attitudes and skills, to ultimately improve professional practice and subsequent patient care outcomes. • Printed educational materials were found to have potential to improve practice, but only slightly. There were no conclusions or estimations able to be made regarding any level of effect on patient care outcomes. • Of the printed educational material interventions that did demonstrate a level of effectiveness, no comments were able to be made regarding the intervention characteristics which may influence effectiveness.
<p>Behaviour Change Strategies to Influence Antimicrobial Prescribing in Acute Care: A Systematic Review</p> <p>Published in Clinical Infectious Diseases, October 2011.</p> <p>Authors: Esmita Charani, Rachel Edwards, Nick Sevdalis, Banos Alexandrou, Eleanor Sibley, David Mullett, Bryony Dean Franklin, Alison Holmes</p>	<p>Primary: to assess the effectiveness of antimicrobial prescribing interventions that, either alone or in combination, aim to influence behaviours.</p> <p>Secondary: 1) to assess the extent to which behavioural and social sciences or social marketing were applied in the design of the interventions and whether this could be related to their effectiveness, and 2) to review qualitative literature for evidence of the perceived barriers and facilitators to behaviour change in antimicrobial prescribing.</p>	<p>Systematic review of qualitative and quantitative literature on antimicrobial prescribing behaviours in acute care, with a purposive sampling methodology. Analysis of eligible studies included an assessment of the extent to which behavioural science and social marketing were used (and any likely corresponding relationship with effectiveness).</p>	<ul style="list-style-type: none"> • Current evidence suggests that when designing new interventions targeting antimicrobial prescribing practices, primary research into prescribing behavioural intention is of paramount importance. Interventions should then be tailored to the target audience in whom behaviour change is desired. • The studies examined in this review attempted to change prescribing behaviours, but none demonstrated structured consideration of applied social or behavioural science or social marketing during design and implementation. • Some recent studies within the literature have incorporated behavioural and social science into their interventions, however these studies were not found to be eligible for inclusion in the review based on quality criteria. • Application of behavioural and social science is significantly underutilised in antimicrobial stewardship interventions, despite its likely significant potential to enable more appropriate practice.

PUBLICATION	OBJECTIVE	METHODS	RELEVANT FINDINGS/CONCLUSION
<p>A systematic review of educational interventions to change behaviour of prescribers in hospital settings, with a particular emphasis on new prescribers</p> <p>Published in the British Journal of Clinical Pharmacology, July 2012.</p> <p>Authors: Nicola Brennan and Karen Mattick</p>	<p>To systematically review educational interventions within the literature which aim to change the behaviour of new prescribers in hospital settings, using an inclusive approach to definitions of educational interventions and study design.</p>	<p>Extensive database searches identified 64 studies published between 1994 and 2010 which were eligible for review and described educational interventions to change the behaviour of prescribers in hospitals settings. Interventions and effectiveness were classified using previously established frameworks and the quality of studies was assessed using a validated tool.</p>	<ul style="list-style-type: none"> • Despite the fact that new prescribers have specific educational needs and organisational pressures (when compared to more experienced prescribers), very few educational interventions within the literature appear to be designed or tailored to this professional group.
<p>Understanding the Determinants of Antimicrobial Prescribing Within Hospitals: The Role of “Prescribing Etiquette”</p> <p>Published in Clinical Infectious Diseases, July 2013.</p> <p>Authors: E Charani, E Castro-Sanchez, N Sevdalis, Y Kyratsis, L Drumright, N Shah, A Holmes</p>	<p>To identify 1) attitudes and perspectives of health professionals on antimicrobial prescribing, 2) barriers to and facilitators of adherence to quality improvement interventions in antimicrobial prescribing, and 3) determinants of antimicrobial prescribing behaviours including contextual, environmental and social factors.</p>	<p>Healthcare professionals (doctors, pharmacists and nurses) throughout the Imperial College Healthcare NHS Trust were interviewed (qualitative, semi-structured) until saturation of themes were reached. Open coding analysis of the interviews generated inductive themes, which were then compared with themes from a recent systematic review of determinants of antimicrobial prescribing behaviours</p>	<ul style="list-style-type: none"> • The prevailing cultural principles of prescribing etiquette appear to be clearly understood by all healthcare professionals. Combined with a generally low awareness of hospital policies relating to antimicrobial prescribing, prescribing etiquette is a very strong determinant of antimicrobial prescribing behaviours. • <i>“There is a dichotomy between the organisational expectation from juniors to follow official policy and the social and contextual norm of adhering to ‘prescribing etiquette’ set by one’s senior colleagues in their clinical groups.”</i> • There exists a broader interpretation of the concept of an evidence base amongst prescribers, many of whom include their personal experiences, and a perception that policies are for the ‘average’ cases. • Leadership within existing clinical groups and social networks must be harnessed to create more effective antimicrobial stewardship interventions.

PUBLICATION	OBJECTIVE	METHODS	RELEVANT FINDINGS/CONCLUSION
<p>Cultures of resistance? A Bourdieusian analysis of doctors' antibiotic prescribing</p> <p>Published in Social Science & Medicine, March 2014.</p> <p>Authors: Alex Broom, Jennifer Broom, Emma Kirby</p>	<p>To explore doctors' antibiotic prescribing decisions within a hospital environment, focusing on the social relations that generate and perpetuate norms of practice.</p>	<p>Using a qualitative inductive approach, 30 doctors from a Queensland hospital participated in semi-structured interviews, with diverse representation across specialty, seniority, and gender. Interview discussions focused on the doctors' everyday attitude towards resistance and the self-reported individual and interpersonal factors influencing antibiotic decision-making.</p>	<ul style="list-style-type: none"> • 'Sub-optimal' antibiotic use was found to be perceived as a realistic and practical choice within the 'social world' of the hospital. The universal threat of antimicrobial resistance appears to be less motivating than social risks, (including the peer-based hierarchy and reputational consequences of 'not doing enough') and emotional pressures to 'do everything possible' for a patient or their family. • <i>"Within the social world of the hospital, few individuals have sufficient social capital to resist the rules of the game, despite recognition that they may be arbitrary... Participation in peer-driven and hierarchically-shaped practice, although frequently described as arbitrary and artificial, offers the potential for greater reward than opting out."</i> • A wide variety of social, cultural and political factors emerged as prominent themes in determining antimicrobial prescribing behaviours. These included risk, fear, uncertainty, time-pressure, benevolence, habit, peer-influence/social norms, hierarchies and the localisation of prescribing practices.
<p>Diagnostic Errors that Lead to Inappropriate Antimicrobial Use</p> <p>Published in Infection Control & Hospital Epidemiology, May 2015.</p> <p>Authors: Gregory A Filice, Dimitri M Drekonja, Joseph R Thurn, Galen M Hamann, Bobbie T Masoud, James R Johnson</p>	<p>To examine diagnostic errors and their relationship to inappropriate courses of antimicrobial therapy.</p>	<p>A retrospective cohort study of 500 randomly selected inpatients who received a course of antimicrobials in a Veterans Affairs hospital in the USA. Blinded reviewers made an assessment of the accuracy of the initial provider diagnosis for the condition that led to antimicrobial therapy, and whether that therapy was appropriate.</p>	<ul style="list-style-type: none"> • Of the cases in which the provider diagnosis was determined to be correct, 62% of antimicrobial courses were appropriate. This was compared to only 5% appropriateness in cases where the provider diagnosis was determined to be incorrect, indeterminate or a sign/symptom rather than a syndrome/disease. • Comparing rates of diagnostic error in this study (antimicrobials-specific) to a recent systematic review of diagnostic error in general inpatients suggested diagnostic error is significantly higher for suspected infections than for other conditions. • The study conclusions suggest that antimicrobial stewardship programs could increase their impact if strategies were designed to help providers make more accurate diagnoses and to know when antimicrobial therapy could be safely withheld.

3. HARC Scholarship Study Tour

3.1 Conference Attendance – ICPIIC 2015



The 3rd International Conference on Prevention & Infection Control was held between 16th – 19th June 2015 in Geneva, Switzerland. The purpose of this bi-annual conference is to provide a global forum for the exchange of knowledge and experience in the prevention of healthcare-associated infection and control of antimicrobial resistance. Participants from over one hundred countries attended this event, with multidisciplinary representation across infectious diseases, microbiological and epidemiological specialties, as well as general medicine, pharmacy, nursing and quality and safety governance. ICPIIC 2015 was selected as a preferred conference to attend due to its range of sessions specific to antimicrobial stewardship, as well as the strong thematic focus on generating behaviour change amongst healthcare workers.

Summary of Important Lectures, Papers and Posters

Although a wide variety of sessions were attended across the conference, the following were considered the most relevant and valuable, and as such have been summarised for inclusion in this report.

Session Title	Implementation Science – Behavioural Change to Implement Best Practices
<i>Presenter</i>	<p>Professor Alison Holmes <i>Imperial College London, Professor of Infectious Diseases and Director of the UK NIHR Health Protection Research Unit (HPRU) in Healthcare Associated Infection and Antimicrobial Resistance</i></p>
<i>Reflections & Key Learnings</i>	<ul style="list-style-type: none"> • To achieve long-term change, health services need to evolve from having a 'purely organisational focus' to a 'behavioural focus' • Organisational guidelines and protocols around antimicrobial prescribing and infection control tend to be 'policy-rich, but implementation-poor'. There are a multitude of contributors to non-compliance amongst healthcare workers, from cultural and socio-political factors (prescribing etiquette, peer influence,

	<p>normalisation of deviance etc.) through to more technical and procedural factors (inconsistencies between multiple guideline sources, information overload, variability of methodological rigour and currency, limited point-of-care accessibility etc.) All of these need to be addressed in order to improve compliance.</p> <ul style="list-style-type: none"> • “Antimicrobial resistance is a social problem requiring a social solution.” • It is incredibly important to target messages and interventions to segmented groups of healthcare workers, as this will vastly improve engagement and degree of effect. • Rapidly evolving technology and associated tech-use behaviours (electronic prescribing, mobile devices and applications, social media etc.) allow for more creative and innovative means of influence, such as through educational gamification and incentivisation.
--	--

Session Title	Understanding cultural drivers of infection prevention & control behaviour and their relevance to improvement strategies
Presenter	Dr Michael A Borg <i>Head of the Infection Control Department at Mater Dei Hospital, Malta, and chair of Malta National Antibiotic Committee</i>
Reflections & Key Learnings	<ul style="list-style-type: none"> • A ‘cultural dimension’ is a concept which describes constructs of identifiable behavioural manifestations, such as masculinity/femininity or individualism/collectivism. Understanding, or at least appreciating, the cultural dimensions of health care workers (both as individuals and as groups) offers valuable insight into the behavioural determinants of the average person. Researchers have found ways to quantify the presence and influence of these dimensions, and thus draw comparisons across different contexts. • Across a number of European studies regarding the influence of culture on antibiotic prescribing, two major cultural dimensions have been identified as correlating with differences in distinct antibiotic behaviours (e.g. prolonged perioperative surgical prophylaxis). These are ‘uncertainty avoidance’ (the extent to which a person will naturally tolerate or avoid certainty-based risk), and ‘power distance’ (the extent to which a person will naturally submit to authority). Uncertainty avoidance and power distance are essentially about managing risk and hierarchy, respectively. • Compared to other countries, the Australian culture tends to have a relatively low index for power distance, and a moderate index for uncertainty avoidance. (We do not know, however, whether these indices would be the same if focusing specifically on the sociocultural construct of an Australian hospital workplace.) • Interventions can aim to change one or more of the following elements of culture, listed from least influence (and easiest to change) to most influence (and most difficult to change); symbols (such as posters or campaigns), heroes (opinion/peer leaders), attitudes, ritualistic behaviours, and finally, beliefs/values.

<p><i>Session Title</i></p>	<p>Use of an innovative colour-based personality profiling tool to guide culture-change strategies amongst different healthcare worker groups (Included in the Innovation Academy Presentations, as well as a conference poster)</p>
<p><i>Presenter</i></p>	<p>Professor Lindsay Grayson¹ & Dr Andrew Stewardson² <i>¹Director of Hand Hygiene Australia and Director of Infectious Diseases at The Austin Hospital, Melbourne Australia</i> <i>²National Project Manager, Hand Hygiene Australia, and Infectious Diseases Physician at The Austin Hospital, Melbourne, Australia</i></p>
<p><i>Reflections & Key Learnings</i></p>	<ul style="list-style-type: none"> • In this study, researchers decided to use an evidence-based personality-profiling tool designed and calibrated by an Australian social science company and linked to Australian census data. The tool was used to predict the personality types of distinct healthcare worker groups; medical officers, nursing/allied health staff, and non-clinical staff. A marketing company then used this information to develop behaviour change messaging for hand hygiene, antimicrobial stewardship and environmental cleaning, targeted to the profile of each healthcare worker group. • The profile of doctors suggests that they consider themselves independent, progressive thinkers who understand the intent of rules but are capable of rationalising why they may not need to comply. Messages thus require a highly personalised approach with a clear outline of the underlying evidence and the positive or negative consequences of their actions. Profiles also vary between different doctor groups; full-time staff specialists (who want to make correct and informed decisions based on best evidence), part-time visiting medical officers (who have a strong sense of authority and affluence and are more concerned about personal reputation or loss of prestige) and junior doctors (who are concerned about their career progression and meeting expectations of peer leaders). • The profile of nursing/allied health staff suggests that this group tries to balance their own needs against the needs of others, and while they are capable of individual decision-making they have a strong sense of being part of a team working towards collective goals. This group is not exclusively information-driven, as emotions and relationships often have a significant impact on their commitment to behaviour changes. Messaging should focus on the present (immediate actions which can have an immediate impact), and use both information and emotional content to engage them in 'the cause', as a cohesive team. • Based on the study results, examples of antimicrobial stewardship messaging targeted to healthcare worker groups could include: <ul style="list-style-type: none"> - For full-time staff specialists: <i>"Antimicrobial prescribing should be rational, with a clear indication, duration and expected outcome."</i> - For part-time visiting specialists: <i>"Prescribe appropriately – or there could be problems"</i> - For junior doctors: <i>"Making efforts to prescribe antibiotics appropriately shows your potential"</i> - For nursing staff: <i>"Caring for your patient means it's okay to ask if the antibiotic therapy is appropriate or still required"</i>

<i>Session Title</i>	External Determinants Influencing HAI & Infection Prevention and Control: Human Factor Design
<i>Presenter</i>	Dr Hugo Sax <i>Head of Infection Control and Hospital Epidemiology, University Hospital of Zurich, Switzerland</i>
<i>Reflections & Key Learnings</i>	<ul style="list-style-type: none"> • When constructing working environments, processes and interventions, we must be aware of the interface between human operations (cognitive, physical, social and emotional factors) and technical operations (tools, architecture and software). • Choosing to break the rules in a healthcare environment, often through relatively minor violations such as taking shortcuts to bypass a system, can become normalised when people see that many others are doing it, and that this practice is largely accepted within the day-to-day workplace culture. • One of the key challenges with infection control (and by extension, antimicrobial stewardship), is that the consequences of poor practice are 'invisible', or at least not directly apparent. Without visible markers, we do not get immediate feedback and as such it can be difficult to amend our behaviours, even when the intent is present. • Developing new 'mental models' (or leveraging existing ones) can be useful in designing behaviour change interventions from a human factors perspective. One example might include adding a line on the floor to subconsciously signal two different zones between a procedural area and a general activity area. Another example might be to use cues that a healthcare worker behaviour is being monitored or watched, as these cues have been shown to improve compliance and honesty.

<i>Session Title</i>	Optimising antimicrobial prescription through e-health: setting, dosing, timing and stewardship
<i>Presenter</i>	Dr Carlos Palos <i>Internist, Intensivist and Coordinator of Infection Control and Antibiotics Committee, Hospital Beatriz Angelo, Portugal</i>
<i>Reflections & Key Learnings</i>	<ul style="list-style-type: none"> • The objective set was the global optimisation of antimicrobial prescribing in a new, 425 bed paper-free hospital near Lisbon, Portugal, using eHealth principles. • A dedicated template was developed within the eHealth platform for prescribing antibiotics. Prescribers must enter a context (treatment or prophylaxis) and indication for antimicrobial therapy, which is automatically matched to a preferred regimen based on the location and facility guidelines. Although this order can be overridden, immediate justification is required – opting for the protocol-driven therapy thus follows the 'path of least resistance' for a user. For each treatment algorithm an automatic stop order may also apply (e.g. 24 hours for most surgical prophylaxis), to curtail unnecessarily long courses. • Recommended dosing information appears by default, however this is based on average patient body weights and types, with normal renal and hepatic function, and thus may need to be changed. • Networked communication was also set up between the physicians, the antibiotics

	<p>committee and the microbiology laboratory, to support antimicrobial stewardship. Emails are automatically generated when an antimicrobial is prescribed outside the indication/context-based protocol, and when highly restricted agents are prescribed. These orders are then reviewed as soon as possible (within 48 hours), with recommendations and feedback provided via email and/or phone.</p> <ul style="list-style-type: none"> • Unfortunately no data was provided around improvement in antimicrobial use or outcomes, nor rates/examples of eHealth related adverse events.
--	--

Session Title	Teaching good infection control practices through fun – Impact of the serious game ‘Flu.0’
Presenter	Dr Anne-Gaelle Venier <i>Hospital Doctor, CCLin Sud-Ouest Hôpital Pellegrin, Bordeaux, France</i>
Reflections & Key Learnings	<ul style="list-style-type: none"> • The objective was to create an app-based educational ‘serious game’ regarding management of patients with influenza, and evaluate the impact of this game on the knowledge and practices of nurses and doctors. • The game ‘Flu.0’ was developed in two versions for both French and English speaking audiences, and can be accessed and played almost anywhere. The user faces nine scenarios and must answer eight targeted multiple-choice questions, with explanations given as to why each option was correct or incorrect. A final score is given to evaluate the players’ relative performance, and the game usually takes no longer than 15 minutes to complete. • In order to evaluate the impact of this intervention, willing participants were asked to complete a questionnaire before and after the game to capture their understanding of the topic and assess markers of their likely practice behaviours. Almost all players (95%) indicated that they learnt something from the game, with intended behaviour change focusing on improved droplet precautions and more accurate diagnoses of influenza.

Session Title	Antimicrobial Stewardship: The Leading Role of Europe and the US
Presenter	Dr Diamantis Plachouras <i>Expert in Antimicrobial Resistance and Healthcare Associated Infections, European Centre for Disease Control, Stockholm, Sweden</i>
Reflections & Key Learnings	<p>Although a great deal of information was delivered during this presentation, the key reflection which is relevant to this project relates to the maturity of some of the European antimicrobial stewardship programs and strategies. UK programs in particular have been established and resourced for quite some time; hospital AMS programs have been mandatory in England since 2008, with similar moves in Scotland (including the formation of the highly effective Scottish Antimicrobial Prescribing Group), also in 2008. In contrast, although a number of major metropolitan hospitals in Australia have had some basic antimicrobial stewardship principles in place for many years, it wasn’t until the inclusion of antimicrobial stewardship within the National Safety & Quality Health Service Standards in 2013 that antimicrobial stewardship programs were effectively mandated for all Australian hospitals, and are being implemented as</p>

	<p>ongoing, systematic initiatives. The culture of antimicrobial stewardship (in terms of awareness, understanding and healthcare worker beliefs and attitudes about antimicrobial prescribing) may therefore be somewhat less mature than in the UK, and as such local change readiness is an important consideration when trying to adapt UK interventions to an Australian context.</p>
--	--

3.2 International Visits

Visits in Glasgow, UK

1. The Scottish Antimicrobial Prescribing Group

The [Scottish Antimicrobial Prescribing Group \(SAPG\)](#) is a national, multidisciplinary committee established in 2008 at the request of the Scottish Government Health Department. Hosted by the Scottish Medicines Consortium, the SAPG coordinates and delivers a national framework for antimicrobial stewardship, and its work promotes and supports the safe and effective use of antimicrobial therapy across primary, secondary and tertiary healthcare settings.



This visit involved attendance at the bimonthly SAPG meeting held on Monday 22nd June 2015, and included delivery of a short presentation about how the CEC Quality Use of Antimicrobials in Healthcare program has successfully adapted a hospital-based antimicrobial prescribing indicator developed by the SAPG for use in NSW. Attendance at the meeting was subsequently followed by a more in-depth discussion with the SAPG project lead, Jacqueline Sneddon.

Reflection and Key Learnings:

- The SAPG consists of up to 50 official members (including the project/secretariat team), averaging approximately 30-40 attendees per bimonthly meeting (including guests).
- Membership of the SAPG is widely representative, including antimicrobial, infectious diseases and microbiology experts across many of the NHS boards (which have responsibility across both primary and tertiary healthcare). What makes this group truly effective however, is the contribution of engaged and committed high-level representatives from a variety of other relevant disciplines and government departments. As a collective, the SAPG is able to draw on the expertise, work and resources of medical and pharmacy directors; nursing, infection control and dentistry representatives, chief executives, primary care leads and academic researchers, as well as key members of Health Protection Scotland, NHS Education for Scotland, and their host organisation, the Scottish Medicines Consortium.
- Beyond its diverse membership, a number of key factors were identified as contributing to the overall effectiveness of the SAPG. These include:
 - Comparative geography – Scotland is one tenth of the size of NSW by land mass, meaning key representatives across the Scottish health boards are (relative to NSW equivalents) better positioned to attend important meetings in-person, and at a minimum of expense in terms of cost and time.

- Decision-making capacity – Representatives selected for the SAPG are generally quite high-level, and thus have considerable capacity to consider and endorse strategic decisions without needing to first consult and seek approval from superiors or other groups. This decision-making capacity allows the SAPG to be highly action-oriented and efficient in dealing with target issues.
- Resourcing for antimicrobial stewardship – the SAPG functions have been funded by the Scottish government since 2008, and since that time every NHS board has received funding for antimicrobial stewardship personnel such as antimicrobial pharmacists. This is vastly different to the state of NSW, where local health districts and networks have received no additional or dedicated funds to support stewardship activities.
- Integrated healthcare model – integrated care in Scotland allows for more effective and efficient collaboration between different health sectors, thus interventions to deconstruct barriers and improve antimicrobial prescribing practice can be more widely implemented and adjusted along a continuum of needs and target groups. This differs from an Australian context, where healthcare funding and organisational responsibilities are far more differentiated by health sector and scope. In Scotland, for example, an intervention to target a distinct prescribing issue which is present across many sectors (e.g. inappropriate quinolone use for UTIs in primary care, tertiary care and residential aged care) could be funded and developed by a representative project team which has access to all essential data sources and can adapt the project to suit delivery in different sectors. In Australia there are a number of barriers to this method (complex funding sources, differing strategic priorities and organisational silos) which are inherent within the healthcare governance structure.

Other Developments:

After the meeting, details were exchanged with a member of the SAPG from NHS Lanarkshire. A visit to the CEC in March-April 2016 was planned for this person, as part of their fellowship field trip for the Scottish Patient Safety Programme. This arrangement has been an excellent opportunity for a number of CEC programs and local hospitals to strengthen their international ties and share learnings across key areas of interest, including antimicrobial stewardship, management of deteriorating patients and patient safety.

2. Health Protection Scotland

[Health Protection Scotland](#) is a Scottish government organisation responsible for coordinating and supporting initiatives which protect against infectious and environmental hazards. As antimicrobial resistance poses a significant and increasing threat to public health, advisers and information analysts within this organisation use available data on antimicrobial prescribing and resistance rates to inform national decisions around antimicrobial stewardship.



This visit was for the purpose of meeting William Malcolm, Pharmaceutical Adviser at Health Protection Scotland and SAPG member, to learn more about how data is used to inform interventions and drive practice change.

Reflection and Key Learnings:

- Scotland appears to have a more established culture of public reporting than is currently present in Australia, particularly with regards to identifiable data on antimicrobial prescribing in both primary and secondary/tertiary care. Whilst Scotland has many of the same challenges as Australia in terms of streamlining data collection, Scottish data on antimicrobial prescribing is more often identified to the level of NHS board or hospital (as opposed to Australia's current approach of reporting mostly national and state level data).
- Data on antimicrobial usage is tracked using existing data infrastructure; hospital-based consumption is monitored via the Hospital Medicines Utilisation Database (HMUD) and primary care usage is monitored via the Prescribing Information Systems in Scotland (PRISMS) database (which is based on prescriptions dispensed in the community). Whilst these surveillance methods are similar to those used in Australia, there are some significant differences which prevent these data pools being compared.
- Surveillance of prescribing quality in primary care is through a series of prescribing indicators, including a 'national quality indicator for total antibacterial use'. Meeting this indicator requires antibacterial use in at least 50% of the practices in each NHS board to be at or below the value of the 25th percentile at baseline, or practices will have made the minimum acceptable reduction towards that level. This is called a 'best-in-class' goal-setting technique, and is a data-driven method for using social norms to promote desirable changes in prescribing behaviours.

3. Gartnavel General Hospital, NHS Greater Glasgow & Clyde

Gartnavel General Hospital is a 465 bed teaching hospital in NHS Greater Glasgow & Clyde, which is the largest NHS Board in the United Kingdom (by population and staffing numbers).



This visit consisted of an afternoon spent with Ysobel Gourlay, one of Scotland's first antimicrobial pharmacists and key member of the antimicrobial stewardship team at Gartnavel General Hospital.

Reflection and Key Learnings:

- Within the Scottish hospital system, many of the day-to-day antimicrobial stewardship tasks and priorities within a major metropolitan hospital are much the same as those in similar-sized hospitals in NSW.

- It is common for NHS health boards in Scotland to summarise their local antimicrobial prescribing guidelines on a large poster, which is posted around the hospital wards and is thus widely used by prescribers due to ease of accessibility. In Australia, it is more common practice for prescribers to access the electronic *Therapeutic Guidelines: Antibiotic* or locally-developed guidelines (pending availability of a computer), or perhaps refer to a lanyard card (limited information, often specific to only one or two indications).

Visits in Edinburgh, UK

4. Western General Hospital, NHS Lothian

Western General Hospital is a 570 bed teaching hospital in NHS Lothian, which encompasses the city of Edinburgh and the nearby Lothian region.



This visit consisted of a meeting with Alison Cockburn, Carol Philip and Eilidh Fletcher, Antimicrobial Pharmacists and Antimicrobial Team Analyst who form part of the stewardship team.

Reflection and Key Learnings:

- The antimicrobial team at Western General Hospital also use a large poster containing summarised NHS Lothian antimicrobial prescribing guidelines, similarly to the poster used at Gartnavel General Hospital. One key difference is that the NHS Lothian poster is printed in a new colour for each yearly update, so that out-of-date posters are easier to recognise and replace as required.
- Western General Hospital have included a data analyst as part of their antimicrobial team. This would be very uncommon in Australia, where data analysts are not usually standalone positions in antimicrobial stewardship (though project-specific pharmacist positions may exist). In NSW public hospitals, data management responsibilities are often incorporated into the expectations of antimicrobial stewardship pharmacists (or other clinical leads), despite significant variation in ability and experience in managing and processing raw data. As a result, some antimicrobial stewardship programs in an Australian context are heavily data-driven in terms of their strategic planning and interventions, whereas others place less emphasis on the detailed examination of local usage and resistance data.

5. NHS Education for Scotland

[NHS Education for Scotland](#) (commonly referred to as 'NES') is a special health board responsible for developing and delivering education and training to Scotland's healthcare workforce.



This visit consisted of a meeting with the Director of the Healthcare Associated

Infections (HAI) Programme, Dr Gill Walker to discuss how education around antimicrobial stewardship is developed and delivered in Scotland.

Reflection and Key Learnings:

- Education and training of healthcare workers in Scotland appears to be very well supported by NES, and NES appears to be well-funded and highly collaborative in its endeavours. Where educational needs are established (via feedback and/or decisions through various channels) programs of work to address the need are constructed and proposed for funding approval at specific points in the work planning cycle. While NES has developed a great many online learning modules, they have not let this platform become their only method of delivery and prefer to assess each educational need based on ideal learning strategies and the target audience.
- The NES HAI Programme has developed a wide range of innovative events and resources to target healthcare worker behaviours via strategic education. Examples of these include:
 - The [*Scottish Reduction in Antibiotic Prescribing \(ScRAP\) Programme*](#), which was developed in conjunction with the SAPG and is targeted towards primary care prescribers. The ScRAP Programme and resources were designed using a quality improvement framework and blended learning approach, involving local practice data and a combination of online learning activities, reflective exercises, structured tutorials and academic detailing.
 - An HAI education and awareness event called [*Strengthening Our Defences*](#), which was designed with a strong patient-centred focus and a goal to “engage, inform & interact” with a widely diverse audience. In designing this event, the project team collaborated with engagement and entertainment experts to construct the event program around “Helen’s Story”, a powerful and multifaceted patient story told using professional actors and mimicking very real scenarios faced by healthcare workers every day. This event was supported by follow up resources and advice on using Helen’s Story to improve infection prevention and control behaviours at a local level.
 - An interactive online educational workbook called [*Antimicrobial Stewardship: The supporting role of the nurse and midwife*](#), which provides digestible lessons to nursing staff which are often able to be integrated with day-to-day practical work. The goal of this workbook is to not only improve a nurse or midwife’s understanding of antimicrobial stewardship, but to also empower them to take suitable actions within their own practice to improve the management of patients who are receiving antimicrobial therapy.

Other Developments:

Intermittent correspondence has continued with Dr Walker, leading to permission to preview NES online learning modules relating to antimicrobial prescribing and HAIs, as well as hosting a meeting with Dr Walker when she visited Sydney in March 2016.

Visits in London, UK

6. Public Health England and NHS Health Education England

[Public Health England](#) is an executive agency of the UK Department of Health, responsible for protecting and improving personal and population health in the UK, and reducing health-related inequalities. [NHS Health Education England](#) is a separate entity with a mandate from the UK Department of Health to support the delivery of education and training, ensuring that the NHS workforce is optimally skilled to deliver safe and high quality care.



Public Health
England



Health Education England

This visit involved a meeting with Dr Diane Ashiru-Oredope, Pharmacist Lead for the Public Health England & Department of Health Expert Advisory Committee on Antimicrobial Resistance and Health Care Associated Infections (ARHAI). At the time, Dr Ashiru-Oredope was employed in dual roles; working for Public Health England, with a part time secondment to NHS Health Education England focusing on implementation of Antimicrobial Prescribing and Stewardship competencies, and sepsis education.

Reflection and Key Learnings:

- The latest [English Surveillance Programme for Antimicrobial Utilisation and Resistance \(ESPAUR\) Report](#) (released in September 2014) was discussed, and the following points were noted:
 - A point prevalence survey of English hospitals in 2011 revealed that the overall prevalence of antimicrobial use in secondary (hospital inpatient) care was 34.7%.
 - Between 2010 and 2013, antibiotic prescribing in hospital inpatients increased by 12%. This appears to be in contrast to Australia, where consumption of antibiotics in a hospital environment is believed to have been gradually decreasing since 2010.
 - A second point prevalence survey in 2014 captured the elements of antimicrobial stewardship programs which had been implemented across English hospitals. This survey revealed that 58% of NHS trusts have 'a separate antibiotic drug chart or chart section', which is vastly different from an Australian context, where almost all hospitals use a standardised chart which does not have separate sections for antimicrobials.
- An '[Antimicrobial Prescribing and Stewardship Competencies](#)' document was released by Public Health England in September 2013, which provided some guidance to clinicians, educational providers and professional societies as to the standards of knowledge and practice reasonably required of all antimicrobial prescribers. To direct competencies and professional development of pharmacists, a more extensive document was developed by the Royal Pharmaceutical Society and the UK Clinical Pharmacists Association called the '[Expert Professional Curriculum for Antimicrobial Pharmacists](#)'. This document appears to be far more extensive and useful in setting incremental expectations of the development and ability of clinicians practicing in the area of antimicrobials than the generic PHE competencies document.

- The [Antibiotic Guardian](#) campaign was discussed, and it was noted that the online pledge uses more targeted, action based messaging than the Australian antibiotic pledge (developed and maintained by NPS MedicineWise). This means that the actions pledged by an individual are far more relevant to their situation, depending on how they have chosen to identify themselves (e.g. GPs, dentists, pharmacists, nurses, members of the public, pet owners, students and educators).

7. Imperial College London

Imperial College London is a public research university closely integrated with the Imperial College Healthcare NHS Trust and [The National Institute for Health Research Health Protection Research Unit \(NIHR HPRU\) in Healthcare Associated Infections and](#)

The logo for Imperial College London, consisting of the words 'Imperial College' stacked above 'London' in a blue, sans-serif font.

[Antimicrobial Resistance](#). The Hammersmith Hospital campus hosts a number of workstreams within the [Centre of Infection Prevention & Management](#) (CIPM), including Workstream 1: Innovation Adoption and Behaviour Change within the context of antimicrobial stewardship and infection prevention.

This visit comprised of a number of meetings with clinical and academic researchers, each involved in some way with antimicrobial stewardship and infection prevention from the perspective of behavioural and social science. The most relevant discussions were had with Esmita Charani, academic research pharmacist at the NIHR HPRU and senior lead pharmacist within the CIPM. Esmita has spent many years developing and contributing to research projects which focus on antimicrobial prescribing behaviours, and a number of these endeavours were discussed.

Reflection and Key Learnings:

- The *Imperial Antimicrobial Prescribing Policy (IAPP)* application for mobile devices was developed through Imperial College and is now used throughout the NHS Trust. Learnings from behaviour and prescribing research were incorporated into the app design, including a very simple and intuitive interface (ease-of-use), consideration prompts (appropriate use of defaults and 'nudges'), and the availability of content without an internet connection (reliable access at the point-of-care). The app had high download rates; 990 junior doctors (100% of target user group) had downloaded it by 12 months, with 250-300 users per month. The average number of user sessions was 1900 per month, compared with 221 'hits' on the intranet version of the prescribing policy. Although uptake of this intervention was quite strong, there was no structured research into whether this translated into improved compliance with the antimicrobial policy or improved patient care outcomes.
- Collaboration between Imperial College researchers, clinicians and a commercial game company led to the development of an app which uses gamification to support and encourage appropriate antimicrobial prescribing in acute care scenarios. *On call: Antibiotics* allows players to manage a caseload of virtual patients and provides immediate feedback to players regarding their performance. The design of this game leverages the influence of friendly competition (e.g. use of leaderboards), tests application of knowledge under stress (e.g. challenging time limits and

increasing difficulty), and uses delayed consequences to demonstrate the potentially far-reaching implications of their decisions (e.g. high rates of unnecessarily broad-spectrum and/or long courses of antibiotics will increase rates of patients presenting with antibiotic-associated diarrhoea and cannula-site infections.)

- As a visiting researcher to Haukeland University in Norway, Esmita was involved in the implementation of a national Norwegian antimicrobial stewardship program. Compared to the UK, Scandinavian countries have been found to a noticeably different culture of antimicrobial use; patients in particular tend to be far more conservative (and at times reluctant) regarding antibiotic use. Within a Norwegian hospital environment, there is a much flatter, more egalitarian interdisciplinary structure. Even visual cues of 'power', such as the uniforms worn (or not worn) by different staff, have been removed or adjusted to be the same across all disciplines and levels. Such differences in the most basic foundations of hospital culture may explain Norway's relative lack of the 'prescribing etiquette' barrier that is so prominent in UK and Australian hospital settings.
- As part of her PhD, Esmita is using a number of strategies including ethnographic research (monitoring prescribing as it happens in the clinical environment) to investigate how attitudes and culture impact antimicrobial use. Although not yet complete, of particular interest will be the 'tracer studies' into how and why patients with the same infection profiles are managed differently by different prescriber groups and specialties.
- Discussing themes of previously published work, Esmita referred to a predominant prescribing culture which values 'socially-constructed knowledge' and 'tacit' guidelines (heavily influenced by peer practice and other social and political factors) over formally endorsed, evidence based guidelines. This is often labelled in the literature as the influence of 'mindlines' versus guidelines.

8. Hammersmith Hospital, Imperial College Healthcare NHS Trust

Hammersmith Hospital is a 350 bed teaching hospital in west London, and forms part of Imperial College Healthcare NHS Trust.



This visit involved time spent with Tracey Lyons and Wendy Lawson (pharmacists involved in antimicrobial stewardship and infectious diseases), attending a clinical education session and an intensive care and infectious diseases ward round.

Reflection and Key Learnings:

- The role of the infectious diseases pharmacist on rounds was very well-established at Hammersmith Hospital. This pharmacist interprets and advises on therapeutic drug monitoring and exerts considerable influence around key antimicrobial prescribing decisions. Although expert pharmacists are frequently included on similar rounds in NSW principal referral hospitals, a lack of dedicated pharmacy staff and opportunities to develop the necessary expertise means such a service is often unable to be offered in other facilities.

- UK hospitals tend to have fewer restricted antimicrobials (called 'alert antibiotics') and less complex restriction policies than many Australian hospitals of the same size. This is particularly true with regards to the mid-level 'orange' restrictions used in Australia, which are commonly criteria-based (rather than requiring case-by-case expert approval). Across the three hospitals visited throughout the UK, none had ever used (or heard of other UK hospitals using) antimicrobial restriction and approval software, which has become quite commonplace in many of the major metropolitan hospitals across Australia.

9. Behavioural Insights Team UK

Jointly owned by the UK government, an innovation charity and its employees, [Behavioural Insights Team](#) is a company which uses behavioural science and research to inform and improve the effectiveness of interventions which target human behaviours. Their work draws on expertise based in economics, psychology and policy-making, with a strong focus on 'nudge' interventions – minor, often low-cost adjustments which can have a dramatic impact on behaviours and outcomes on a large scale.

**THE
BEHAVIOURAL
INSIGHTS TEAM.**

This visit consisted of a meeting with Hugo Harper, a senior adviser at BIT who was involved in a recent project targeting antimicrobial prescribing behaviours in general practitioners.

Reflection and Key Learnings:

- GP practices within the UK with the highest rates of antimicrobial prescribing (by number of prescriptions dispensed) were sent letters from the Chief Medical Officer informing them that they were prescribing antibiotics at a higher rate than 80% of the other practices within their NHS Trust. This intervention was based on the influence of social norm messages and personalised feedback delivered by a high-profile messenger. Over the following months, antimicrobial prescribing in the practices which received the letters decreased by 3.3%, representing over 73 000 fewer antibiotic prescriptions.
- Projects developed by the Behavioural Insights Team are investigated using randomised controlled trial methodology and often require sizable samples and a pre-existing data collection infrastructure. Although this method may not be adaptable to hospital-based antimicrobial stewardship interventions, there are still considerable lessons to be learned from the outcomes of their research.
- Behavioural Insights Team have developed a simplified framework to guide intervention design within the context of behaviour change. The framework is called [EAST](#) and stands for:
 - EASY – create a 'path of least resistance' to the preferred behaviour using defaults and choice architecture, remove barriers and 'hassle factor', and simplify messages or action requests.

- ATTRACTIVE – develop and disseminate messages which are compelling, engaging and where appropriate, personalised. Incentivisation and gamification can be powerful techniques to make a behaviour more attractive.
- SOCIAL – use social norms to shift people towards a desired behaviour (if the desired behaviour is the norm) and use the power of social influences via peer networks or by asking people to make a commitment to others.
- TIMELY – provide behavioural prompts to people when they are likely to be most receptive or when they are needed the most, and focus on the immediate costs and benefits of their actions rather than future impacts.

4. References

1. Duguid M and Cruickshank M (eds). *Antimicrobial Stewardship in Australian Hospitals*. Sydney : Australian Commission on Safety and Quality in Health Care, 2010.
2. Australian Commission on Safety and Quality in Health Care. *National Safety and Quality Health Service Standards*. Sydney : Australian Commission on Safety and Quality in Health Care, 2011.
3. Dellit TH, Owens RC, McGowan JE Jr, Gerding DN, Weinstein RA, Burke JP, Huskins WC, et al. Infectious Diseases Society of America; Society for Healthcare Epidemiology of America. Infectious Diseases Society of America and the Society for Healthcare Epidemiology of America guidelines for developing an institutional program to enhance antimicrobial stewardship. *Clin Infect Dis*. 2007 Jan 15; 44(2):159-77.
4. Davey P, Brown E, Charani E, Fenelon L, Gould IM, Holmes A, Ramsay CR, Wiffen PJ, Wilcox M. Interventions to improve antibiotic prescribing practices for hospital inpatients. *Cochrane Database of Systematic Reviews* 2013, Issue 4. Art. No.: CD003543. DOI: 10.1002/14651858.CD003543.pub3.
5. Charani E, Castro-Sanchez E, Sevdalis N, Kyratsis Y, Drumright L, Shah N and Holmes A. Understanding the Determinants of Antimicrobial Prescribing Within Hospitals: The Role of “Prescribing Etiquette”. *Clin Infect Dis*. 2013; 57(2):188-96.
6. Charani E, Edwards R, Sevdalis N, Alexandrou B, Sibley E, Mullett D, Franklin BD and Holmes A. Behaviour Change Strategies to Influence Antimicrobial Prescribing in Acute Care: A Systematic Review. *Clin Infect Dis*. 2011;53(7):651-662
7. Broom A, Broom J, Kirby E. Cultures of resistance? A Bourdieusian analysis of doctors' antibiotic prescribing. *Soc Sci Med*. 2014; 110:81-88