REVIEW 10.1111/1469-0691.12803

Success stories of implementation of antimicrobial stewardship: a narrative review

B. Huttner[1], S. Harbarth[1], D. Nathwani[2] and on behalf of the ESCMID Study Group for Antibiotic Policies (ESGAP)

1) *Infection Control Programme and Division of Infectious Diseases, Geneva University Hospitals and Faculty of Medicine, Geneva, Switzerland and* 2) *Infection Unit, Ninewells Hospital & Medical School, Dundee, UK*

Abstract

It has been increasingly recognized that antimicrobial stewardship (AMS) has to be a key component of any efforts that aim to mitigate the current global antimicrobial resistance (AMR) crisis. It has also become evident that AMR is a problem that cannot be tackled by single institutions or physicians, but needs concerted actions at regional, national and supra-national levels. However, it is easy to become discouraged, given the problems that are often encountered when implementing AMS. The aim of this review is to highlight some of the success stories of AMS strategies, and to describe the actions that have been taken, the outcomes that have been obtained, and the obstacles that have been met. Although the best approach to effective AMS remains elusive and may vary significantly among settings, these diverse examples from a range of healthcare contexts demonstrate that effective AMS is possible. Such examples will inform others and encourage them to formally evaluate and share their results with the global stewardship community.

Keywords: antibiotic policy, antibiotic stewardship, antibiotic use, antimicrobial resistance, unintended consequences

Article published online: 8 October 2014

Clin Microbiol Infect

Corresponding author: B. Huttner, Infection Control Programme, Division of Infectious Diseases, Geneva University Hospitals and Faculty of Medicine, Rue Gabrielle-Perret-Gentil 4, 1211 Geneva 14, Switzerland

E-mail: benedikt.huttner@hcuge.ch

Introduction

Antimicrobial resistance (AMR) is a problem requiring global solutions; antimicrobial stewardship (AMS) is a key component in addressing this issue [1]. However, many hospitals across the globe still lack AMS programmes, primarily because of a lack of funding (Howard, 2013 23rd ECCMID, Abstract O475). The results from published surveys suggesting that approximately half of all hospitals have AMS programmes very likely represent an overestimation of the true prevalence of AMS activities, owing to significant non-response bias and the use of rather broad definitions of what constitutes an AMS programme. This low level of activity is a concern, given that there is now good evidence that AMS programmes in hospitals can reduce overall antibiotic use and have a positive impact on the incidence of *Clostridium difficile* infection (CDI) and possibly also on AMR and clinical outcomes [2,3].

All too often, discussions about AMS are restricted to the inpatient setting, where there is high antibiotic use, a vulnerable patient population, and 'ideal' conditions for the transmission of multidrug-resistant organisms (MDROs). Most antibiotic use, however, occurs in the community, and often involves antibiotics for self-limiting viral infections in otherwise healthy people [4]. However, in the community setting, there have been many large-scale antibiotic awareness campaigns conducted at regional and national levels, and some have been 'successful' in reducing outpatient antibiotic use [5,6].

This narrative review aims to illustrate some of the 'success stories' of AMS—defined as any intervention aimed at improving the use of antimicrobials—implemented on a larger scale. Obviously, this leads to the question of how 'success' should be defined in the context of AMS: a reduction in overall antibiotic use and by what measure, a reduction in the use of specific antibiotic classes, a reduction in key outcomes such as

the incidence of infections with MDROs or CDI, or even changes in mortality. The metrics for measuring these outcomes remain challenging to define, obtain, and interpret, but are crucial if we are to convince healthcare managers and policy-makers to invest increasingly scarce resource in AMS [7]. Ultimately, 'success' is, however, in the eye of the beholder, and in this review we did not tie our perception of 'success' to specific outcomes, as these are often not available, and the implementation of AMS activities alone in a large setting can already sometimes represent a 'success' story, given the many obstacles.

It is important to keep in mind that this review is not aimed to be a comprehensive, systematic description of worldwide AMS activities. It is rather aimed at providing a broad description of some encouraging AMS stories from a convenience sample of case stories and experiences around the world (Fig. 1).

Success stories

Australia

Fluoroquinolones are known as an antibiotic class with a particularly detrimental impact on the selection and spread of AMR [8,9]. In Australia, this was recognized earlier than elsewhere, and the use of this antibiotic class has long been restricted by guidelines favouring alternative options, and the limitation of prescription subsidies for this antibiotic class by the Pharmaceutical Benefits Scheme to very specific indications recognized by the guidelines [10]. As a consequence, Australia is one of the lowest overall users of fluoroquinolones among high-income countries (less than 0.6 defined daily doses/1000 inhabitants per day, whereas most European countries are well above one defined daily dose/1000 inhabitants per day), and, despite relatively high overall antibiotic use in the community, rates of resistance to fluoroquinolones are low as compared with many European countries (in 2010, 5.2% of *Escherichia coli* isolates from community-acquired infections were fluoroquinolone-resistant in Australia, whereas for most European countries this proportion is well above 15%) (EARS-Net: http://www.ecdc.europa.eu/en/healthtopics/antimicrobial_resistance/database/Pages/database.aspx (accessed 16 October 2014)) [10–12].

Australia has also been active in inpatient AMS. The Australian Commission on Safety and Quality in Health Care —a government agency—has made surveillance of AMR and antibiotic usage a priority, and since 2013 AMS has become a criterion for accreditation of health services. In particular, hospitals are required to have an AMS programme in place, provide treatment guidelines, and monitor antibiotic use. The recent introduction of measurable clinical standards for stewardship in Australian hospitals will enhance the pivotal place of stewardship in everyday clinical practice. The impact of this is awaited with interest.

Chile

Dispensing of antibiotics without a medical prescription is a problem in many low-income and middle-income countries, where regulations are either non-existent or insufficiently enforced [13,14]. In 1999, Chile implemented a policy enforcing a ban of over-the-counter use of antibiotics without prescription [15]. The policy, also accompanied by a public campaign, was associated with a rapid 30% decrease in overall antibiotic use during the first years after its implementation [16,17]. Unfortunately, antibiotic use increased again between 2003 and 2008, but remains below that in the pre-intervention period [15]. Although the reasons for the increase are unclear (the lack of monitoring of compliance with the measures and the absence of additional interventions are mentioned in the literature), it illustrates that the long-term sustainability and associated cost/benefit ratio of AMS interventions need to be considered [15].

China

Like other countries, China has seen a rapid increase in MDROs over the last decade, and overprescribing of antibiotics is common in all settings, as is self-medication with antibiotics in the general population [18–21]. The Chinese Ministry of Health has recognized the dire situation, and launched a national campaign in 2011 to promote AMS in healthcare settings by establishing mandatory administrative strategies for the rational use of antimicrobials with fixed targets and audits [22]. Long-term data on the impact of these actions are lacking, but preliminary analyses suggest that there may have been a reduction in antibiotic use in the outpatient and inpatient settings between 2011 and 2012 (the proportion of patients prescribed an antimicrobial decreased from 68% to 58% for the inpatient setting, and from 25% to 15% for the outpatient setting) [22,23]. Although it is encouraging that the world's most populous country is taking the problem of antibiotic misuse seriously, it is unclear whether predefined government targets for antibiotic use really constitute the best approach to ensure appropriate use for all patients.

France

France has one of the highest levels of outpatient antibiotic use in Europe [24]. Over the last decade, France implemented three national action plans (2001–2005, 2007–2010, and 2011–2016) to preserve the effectiveness of antibiotics. As part of the action plans, an intensive yearly public campaign called