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Initiatives and resources to promote antimicrobial stewardship

José Ramón Paño-Pardo^{a,*}, José Campos^b, Clara Natera Kindelán^c and Antonio Ramos^d

^aUnidad de Enfermedades Infecciosas y Microbiología Clínica, Servicio de Medicina Interna, Hospital Universitario La Paz-IDIPAZ, Madrid, Spain

^bLaboratorio Antibiótico, Centro Nacional de Microbiología, Instituto de Salud Carlos III, Majadahonda, and Consejo Superior de Investigaciones Científicas, Madrid, Spain

^cServicio de Enfermedades Infecciosas and IMIBIC, Hospital Universitario Reina Sofía, Córdoba, Spain

^dUnidad de Enfermedades Infecciosas, Servicio de Medicina Interna, Hospital Universitario Puerta de Hierro-Majadahonda, Madrid, Spain

ABSTRACT

Keywords:

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The development of an antimicrobial stewardship program (ASP) requires institutional support. However, obtaining sufficient institutional support is often a complex task that requires convincing the hospital's managers of the benefits of these programs. Additionally, in the design and implementation of an ASP, antimicrobial stewardship (AS) leaders need tools for diverse purposes, such as measuring antimicrobial consumption, education and training and designing protocols. In this review we provide useful information for AS promoters to facilitate the task of designing and implementing an ASP. First, we summarize information about various institutions that promote AS and include evidence that supports the need for and benefits of these programs. Then, several campaigns promoting AS are described. Finally, online resources for professionals dealing with AS are briefly summarized.

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Iniciativas y recursos para promover la optimización del uso de antibióticos

RESUMEN

Palabras clave:

Optimización del uso de antibióticos
Instituciones sanitarias
Campaña sanitaria
Educación

La puesta en marcha de un programa de optimización del uso de antibióticos requiere apoyo institucional. La obtención de este apoyo institucional frecuentemente es una tarea compleja que hace preciso persuadir a los equipos directivos del hospital de los beneficios de estos programas. Además del apoyo institucional, los profesionales sanitarios implicados en el diseño e implementación de este tipo de programas necesitan herramientas para medir el consumo de uso antibiótico, para el desarrollo de actividades formativas y para la elaboración de protocolos, entre otros. En esta revisión se pretende recopilar información potencialmente útil para los profesionales encargados del diseño e implementación de este tipo de programas. Inicialmente se revisan las principales instituciones e iniciativas de apoyo a las actividades de mejora del uso de antibióticos y finalmente se resumen brevemente algunos recursos disponibles en la red para profesionales implicados en este tipo de actividades.

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Introduction

The current antibiotic crisis has led many institutions to commit to the solution or amelioration of one of today's most important public health issues. Efforts should target at least one of these three primary areas of intervention: *a*) the discovery and approval of new antimicrobials; *b*) the minimization of the spread of antimicrobial resistance through infection control measures; and *c*) the optimization of antimicrobial use by the implementation of antimicrobial stewardship (AS) programs.^{1,2}

Improving antimicrobial use in healthcare centers is a relevant but complex task to achieve and should be accomplished in an organized fashion, preferably through the development of multidisciplinary quality control programs. These programs should define their priorities according to their local needs and set objectives that require periodic verification.^{1,3,4}

Institutional support is critical for these programs to succeed because healthcare centers must provide AS programs with sufficient resources to be operational; and nearly as important, they must provide the institutional framework in which these programs are to be embedded. Local AS leaders frequently face the challenge of convincing hospital administrators of the necessity and benefits of implementing such a program as the first step in obtaining sufficient resources and institutional support. Then, if the hospital or other

*Corresponding author.

E-mail: joserrapa@gmail.com (J.R. Paño-Pardo).

healthcare managers agree to provide support, programs must be designed and implemented, often starting from scratch.^{5,6}

These are some of the reasons why embarking on AS poses a significant challenge, even for the most motivated.⁷ In order to facilitate the implementation and operation of AS programs, here we review and summarize information and resources provided by a broad array of individuals and institutions that can be useful to local AS promoters in the design and implementation of an AS program.

Healthcare agencies and other institutions promoting antimicrobial stewardship

Listed below are some of the more relevant institutions and agencies promoting AS (in alphabetical order), and their primary objectives and contributions to this field are described.

- *Alliance for the Prudent Use of Antimicrobials (APUA)* (<http://www.tufts.edu/med/apua/>). APUA is a global non-governmental organization located in Boston (Tufts University Medical School) that has fought to preserve the effectiveness of antimicrobial drugs for over 30 years. It promotes investigation, education and advocacy programs to control antibiotic resistance and seeks to prolong the clinical utility of antibiotics.
- *British Society for Antimicrobial Chemotherapy* (<http://bsac.org.uk>). Its primary aim is to improve the prevention, diagnosis and treatment of infections by supporting the development, discovery and appropriate and effective use of antimicrobial agents. Recently, BSAC has set up a UK-focused, internationally available comprehensive campaign called Antibiotic Action.⁸
- *Centers for Disease Control and Prevention (CDC)* (<http://www.cdc.gov>). The CDC promotes and participates in several initiatives in this field. It is one of the world's leading lobbying groups with the capability to influence legislators. The CDC has designed a comprehensive campaign to foster antimicrobial stewardship (Get Smart), which will be described later.
- *European Centre for Disease Prevention and Control (ECDC)* (<http://www.ecdc.europa.eu/en/Pages/home.aspx>). This institution is considered by some as the European counterpart of the United States CDC, although there are significant differences between them. The ECDC's antimicrobial activities are coordinated within its Antimicrobial Resistance and Healthcare-associated Infections Programme (ARHAI) (<http://www.ecdc.europa.eu/en/activities/diseaseprogrammes/ARHAI/Pages/index.aspx>). In addition to the Antibiotic Awareness Day (AAD) Campaign, the ECDC leads the European Surveillance of Antimicrobial Consumption program (ESAC), which provides relevant input regarding antimicrobial consumption in many European countries.⁹ These data could be used to better describe the quality of antibiotic prescribing patterns in hospitalized patients and in ambulatory care.^{10,11}
- *ESCMID Study Group on Antibiotic Policy (ESGAP)* (<http://www.escmid.org/index.php?id=140>). This study group of the European Society of Clinical Microbiology and Infectious Diseases is deeply involved in AS. Among its aims are the promotion of awareness of antimicrobial misuse as well as education and training in the appropriate use of antimicrobials through workshops and courses. ESGAP has led several initiatives such as the antimicrobial consumption calculator, the inventory of forgotten antibiotics,¹² a global survey on colistin use and a global survey exploring the extent of AS programs around the world. In addition, ESGAP is currently developing a specific website in order to foster an exchange of experience with AS among healthcare professionals, which is expected to be released in May 2013.
- *HealthCare Infection Control Special Interest Group (HICSIG) of the Australasian Society of Infectious Diseases (ASID)* (http://wiki.asid.net.au/index.php?title=Main_Page). This organization's main goal consists of facilitating collaboration and consensus among different

healthcare specialists about approaches to healthcare infection prevention and control and AS in Australia and Southeast Asia. This is a very active working group, promoting several educational activities as well as consensus documents on this topic, which are greatly valued beyond the boundaries of its primary area of influence. Its website, in an elegant wiki-format, provides a wealth of useful information and downloadable materials such as treatment and prophylaxis guides, surveillance systems and antimicrobial consumption measures, as well as access to a large number of related links.

- *Infectious Diseases Society of America, IDSA* (<http://www.idsociety.org/Index.aspx>). In concordance with other scientific societies, IDSA has highlighted the need to promote AS in healthcare centers. One of the most relevant contributions of IDSA to the field of AS is the set of comprehensive guidelines endorsed by the society in 2007 about this topic.³ Many AS programs around the world have used these guidelines as a reference in the process of designing and implementing their own programs.¹³ IDSA has an active role in lobbying for a change in the regulatory process of approval for new antimicrobials.¹⁴ In cooperation with other scientific societies, IDSA has recently endorsed a consensus document prioritizing the research needs in the field of AS.¹⁵
- *Scottish Antimicrobial Prescribing Group (SAPG)* (http://www.scottishmedicines.org.uk/SAPG/Scottish_Antimicrobial_Prescribing_Group_SAPG_). SAPG is a clinical multi-disciplinary forum created at the request of the Scottish Government Health Department. This group offers continuous education in quality indicators and standards of use for antibiotics, providing tools for training (and evaluation) as well as consensus documents and protocols for antibiotic use in various clinical syndromes.¹⁶
- *The Society for Healthcare Epidemiology of America (SHEA)* (<http://www.shea-online.org>). SHEA is an American professional society whose objectives are to reduce nosocomial and healthcare associated infections and to promote patient safety and reduce antibiotic resistance.^{15,17}
- *SWAB (The Dutch Working Party on Antibiotic Policy)* (<http://www.swab.nl/english>). Dutch Infectious Diseases, Medical Microbiology and Hospital Pharmacy societies participate in the Dutch Working Party on Antibiotic Policy. Its major goal is to contribute to the containment of antimicrobial resistance by optimizing the use of antibiotics. This institution is involved in the surveillance of antibiotic use and the resistance of several microorganisms.¹⁸ Among other activities, SWAB has developed national guidelines for the use of antibiotics in hospitalized adult patients.¹⁹

The World Health Organization (WHO) (<http://www.who.int/en/>) has issued a global strategy to fight against antimicrobial resistance through the following: a) policy guidance, support for surveillance, technical assistance, knowledge generation and partnerships, disease prevention programs and disease control programs; b) the quality, supply and rational use of essential medicines; c) infection prevention and control; d) patient safety; and e) laboratory quality assurance. The WHO has issued guidelines to assist countries in setting up systems to monitor antimicrobial resistance and implement interventions in a clinical multi-disciplinary forum created at the request of the Scottish Government Health Department. This group offers continuous education in quality indicators and standards of use for antibiotics, providing tools for training (and evaluation) as well as consensus documents and protocols for antibiotic use in various clinical syndromes.

Institutional campaigns to improve antimicrobial use

There has been increasing interest in AS in the hospital setting, but antibiotic stewardship in the outpatient setting has been somewhat neglected, despite the fact that the vast majority of all

antibiotics for human use are prescribed in the primary care setting.²² The understanding of antibiotics among the general population is usually poor, so educational activities directed at the public and at health professionals are an important part of the majority of campaigns to reduce the inappropriate use of antibiotics.²³ However, useful data linking the campaign to decreased antibiotic use are often scarce. Interventions to optimize antimicrobial prescribing are of poor quality and are not based on robust theoretical science based on behavior and social science.²²

"Get Smart" from the Centers for Disease Control (CDC, USA) (<http://www.cdc.gov/drugresistance/index.html>)

According to the CDC, antibiotic therapy is one of the most important tools available to combat life-threatening bacterial infections; however, overuse of antibiotics promotes antibiotic resistance and compromises their effectiveness. People infected with antimicrobial-resistant organisms are more likely to have longer, more expensive hospital stays, and may be more likely to die as a result of the infection; resistant infections are more challenging to treat, lead to more and longer hospital stays, and increase a patient's risk of death. Following are education campaigns developed by the CDC to address the issue of antimicrobial resistance in various settings:

- *Get Smart: Know When Antibiotics Work* (<http://www.cdc.gov/getsmart/>). This campaign aims to reduce the rising rate of antimicrobial resistance by promoting adherence to appropriate prescribing guidelines among providers, decreasing demand for antibiotics for viral upper respiratory infections among healthy adults and parents of young children, and increasing adherence to prescribed antibiotics for upper respiratory infections caused by bacteria.
- *Get Smart for Healthcare: Know When Antibiotics Work* (<http://www.cdc.gov/getsmart/healthcare/>). Get Smart for Healthcare is a CDC program focused on improving antibiotic use in inpatient healthcare facilities, beginning with hospitals and then expanding to long-term care facilities. The goal of Get Smart for Healthcare is to optimize the use of antimicrobial agents in inpatient healthcare settings by focusing on proven strategies to help hospitals and nursing homes implement interventions to improve antibiotic use. (Editor's note: I removed the last sentence as it is a bit redundant and doesn't add new information to the paper).
- *Get Smart: Know When Antibiotics Work on the Farm* (<http://www.cdc.gov/narms/get-smart.html>). Commonly referred to as Get Smart on the Farm, this campaign promotes appropriate antibiotic use in veterinary medicine and animal agriculture. Get Smart on the Farm follows the World Health Organization's definition of appropriate use of antibiotics as a use of antibiotics which maximizes therapeutic effect and minimizes the development of antimicrobial resistance.
- *Get Smart About Antibiotics Week* (November 18-24, 2013) (<http://www.cdc.gov/getsmart/campaign-materials/week/index.html>). This has been an annual campaign to coordinate the work of the CDC's Get Smart: Know When Antibiotics Work, its state-based partners, non-profit partners and for-profit partners, united in promoting the observance of antibiotic resistance and the importance of appropriate antibiotic use. The campaign organized its first annual Get Smart About Antibiotics Week in 2008. The success of the pilot year was measured by a) dissemination of educational materials and messages, b) partner satisfaction, and c) media interest. The 2013 campaign is the fourth year of an international collaboration, which will coincide with European Antibiotic Awareness Day (<http://ecdc.europa.eu/en/EAAD/Pages/Home.aspx/>), Australia's Antibiotic Awareness Week (<http://www.nps.org.au/conditions-and-topics/topics/campaigns-events/>

antibiotic-resistance-fighter) and Canada's Antibiotic Awareness Week (http://antibioticawareness.ca/?page_id=157).

World Health Day 2011. Combat drug resistance: No action today means no cure tomorrow (WHO)

The WHO selected combating antimicrobial resistance as the subject for World Health Day, 2011. The WHO called on all key stakeholders, including policy-makers, planners, the public, patients, practitioners, prescribers, pharmacists, dispensers and the pharmaceutical industry to act and take responsibility for combating antimicrobial resistance. On this World Health Day (http://www.who.int/mediacentre/news/statements/2011/whd_20110407/en/index.html), the WHO issued a policy package to get everyone, especially governments and their drug regulation systems, on the right track and with the right measures, such as expanding surveillance efforts, improving drug regulation and supply systems, fostering improved use of medicines for human and animal health and actively preventing and controlling infections in health services and beyond.

European Union (EU) and the European Centre for Disease Prevention and Control (ECDC)

The EU Commission formulated a strategy against Antimicrobial Resistance, and the EU Health Ministers had adopted Council recommendations on the prudent use of antimicrobial agents in human medicine in 2001 (<http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:52001DC0333:EN:HTML>; <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2002:034:0013:0016:EN:PDF>), with many more initiatives following. Last year, the European Commission released its action plan against the rising threats from antimicrobial resistance (http://ec.europa.eu/dgs/health_consumer/docs/communication_amr_2011_748_en.pdf).

Another initiative is European Antibiotic Awareness Day (EAAD) (18th of November each year) (<http://ecdc.europa.eu/en/eaad/Pages/Home.aspx>) that provides a platform and support for national campaigns on the prudent use of antibiotics. Whereas 32 countries participated during the first year (2008), in 2012 over 40 countries had activities. Moreover, in 2012, the World Health Organization Regional Office for Europe actively supported the campaign for the first time. The EAAD is an annual European public health initiative to raise awareness about the threat to public health from antibiotic resistance and encourage prudent antibiotic use. The latest data confirm that, across the European Union, the number of patients infected by resistant bacteria is increasing and that antibiotic resistance is a major threat to public health.

Online resources for antimicrobial stewardship

Antimicrobial Stewardship requires processing large amounts of information that must be delivered both to hospital managers and prescribers. Many interventions within AS programs are aimed at providing clinicians with better tools for decision making regarding antimicrobial prescribing, ranging from interactive educational activities to local antimicrobial protocols. As part of the AS program, these interventions should be tailored to local needs. For example, aggregated antimicrobial consumption and the quality of antimicrobial prescription must be analyzed in order to define priorities and provide feedback to managers and prescribers. The Internet provides immediate access to continuously updated information and resources in the field of antimicrobial resistance and AS programs that could assist these programs in their performance.^{24,25} Indeed, The Internet and other web 2.0 resources are the environment through which many of the AS interventions are practiced.²⁶

In this part of the review, useful web-based information and resources for the design and progress of AS programs will be listed. Resources are classified in the following categories according to the type of information provided: a) information on the status of antimicrobial resistance; b) scientific evidence supporting the need for AS programs; c) educational and training resources; d) resources to measure antimicrobial consumption; e) blogs; and f) specific institutional programs in hospitals.

Information on the status of antimicrobial resistance http://ecdc.europa.eu/en/publications/all_publications/arhai/Pages/arhai.aspx

The ECDC, working through EARS-Net (European Antimicrobial Resistance Surveillance-Network), is embedded in the ARHAI-program and provides access to data on the status of seven invasive pathogens: *S. pneumoniae*, *S. aureus*, *E. coli*, *E. faecalis*, *E. faecium*, *K. pneumoniae* and *P. aeruginosa*. It includes an easy-to-use form to perform customized searches (http://ecdc.europa.eu/en/healthtopics/antimicrobial_resistance/epidemiological_data/Pages/ears-net_database.aspx).

Scientific evidence supporting antimicrobial stewardship programs

The CDC, within their "Get Smart for Healthcare" Campaign (<http://www.cdc.gov/getsmart/healthcare/support-efforts/index.html>), gathers relevant information that scientifically supports AS programs. It includes literature on the impact of AS programs on antimicrobial use, cost and resistance in an organized and comprehensive manner. The ECDC provides useful information about the relevance of antimicrobial resistance, its relation to antimicrobial use and feasible interventions to mitigate this problem within the Antibiotic Awareness Day Campaign (<http://ecdc.europa.eu/en/eaad/antibiotics/Pages/antibiotics.aspx>) in the form of factsheets specific for healthcare professionals and the general public.

Educational and training resources for antimicrobial stewardship

The PAUSE (Prudent Antibiotic User) Website (<http://www.pause-online.org.uk/>) promoted by the BSAC, provides standardized teaching resources for antimicrobial prescribing based on well-designed and presented, patient-focused interactive sessions. This website is primarily targeted to undergraduate students and unfortunately has been fairly inactive lately.

- National Prescribing Service-Learning Activity Management System (NPS-LAMS) (<http://www.nps.org.au>). The NPS is an Australian not-for-profit organization funded by the Australian Government Department of Health and Ageing. The targeted activities for healthcare professionals are primarily educational. The NPS has interactive case-studies-based antimicrobial e-learning modules among its educational resources (<http://www.nps.org.au/health-professionals/professional-development/online-learning>).
- e-bug (<http://www.e-bug.eu/>). Is a very basic, two-level open-access educational resource targeted at primary and secondary school students. The website seeks to promote knowledge of microorganisms and make the spread, prevention and treatment of infections fun and accessible for students.

Online resources to measure antimicrobial consumption

The WHO Collaborating Centre for Drug Statistics Methodology (<http://www.whocc.no>), based in Oslo, Norway, is responsible for the coordination of the Anatomical Therapeutic Chemical (ATC) classification system and the Defined Daily Dose (DDD), which, as a

measuring unit, have become the gold standards for international drug utilization research. On its website, this institution provides a comprehensive and updated list of antimicrobial DDD values (http://www.whocc.no/atc_ddd_index/). Regarding antimicrobial DDD, ESGAP provides a very useful online DDD calculator (http://www.esamid.org/research_projects/study_groups/antibiotic_policies/abc_calc/).

The ESAC-NET, European Surveillance of Antimicrobial Consumption-Network website (<http://www.ecdc.europa.eu/en/activities/surveillance/esac-net/pages/index.aspx>) is a European surveillance program coordinated by the ECDC. It provides data on antibiotic, antiviral and antimycotic consumption from 34 European countries.

Resources for local guidelines and protocol development

- National Institute for Health and Clinical Excellence (NICE) (<http://www.nice.org.uk>). NICE's website belongs to the National Health Service in the UK, in which primary healthcare resources are offered. It includes summaries, clinical guidelines and public health guidelines as well as interactive and free educational tools for professionals online in connection with several fields of medicine, infectious diseases among them.
- Scottish Intercollegiate Guidelines Network (SIGN) (<http://www.sign.ac.uk/>). A website that is part of Health Care Improvement Scotland, SIGN provides clinical guidelines on infectious diseases, both in relation to their diagnosis and to their treatment. It illustrates how to develop clinical guidelines and the ways in which they can be implemented.
- Adapte (<http://www.adapte.org>). Is a website devoted to the adaptation of clinical guidelines to different local contexts, providing a guidance manual as well as a kit of useful resources and tools.
- Antibiotic (<http://www.antibiotic.com>). Is a website of French origin designed as a tool to support therapeutic decisions. Its principal aim is to achieve a rational use of antimicrobials in primary healthcare in accordance with the recommendations of French medical societies. It provides a multi-step search system clinicians can use to choose the most appropriate antibiotic for their current situation.

Blogs

- InfectionNet (<http://www.infectionnet.org>). Is an infectious diseases blog authored by Jim Hutchinson, a Canadian medical microbiologist, which provides resources and tools to promote the rational use of antibiotics, in addition to teaching materials and activities.
- Proantibiotics (<http://proantibiotics.com/>). This is a blog in Spanish created by medical professionals at Hospital Universitario La Paz in Madrid, Spain. It is focused on the use of antibiotics in hospitals and provides access to news, article reviews, courses, open clinical cases, resources and assistance for implementing antimicrobial stewardship programs in hospitals.

Specific institutional programs in hospitals

These sites include programs that are coordinated by experts in infectious diseases and they provide strategies for determining the appropriate empirical treatment, microbiological diagnosis, de-escalation, sequential therapy and the duration of antimicrobial therapy. A list of some of these websites is provided in Table 1.

Conflicts of interest

The authors declare that they have no conflicts of interest.

Table 1

Institutions with an open-access antimicrobial stewardship website

Institution	URL
Johns Hopkins (Baltimore)	http://www.hopkinsmedicine.org/amp/about/
The Nebraska Medical Center	http://www.nebraskamed.com/careers/education-programs/asp
University of Miami	http://ugotabug.med.miami.edu/
University of California San Francisco	http://clinicalpharmacy.ucsf.edu/idmp/
University of Pennsylvania Health System	http://www.uphs.upenn.edu/bugdrug/

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