

## Antibiotic Stewardship

Antibiotic stewardship is a key component of a multifaceted approach to slowing the emergence of antibiotic resistance. In a clinical setting, good antibiotic stewardship strategies are based upon the broad concept of appropriate use. This involves selecting the appropriate drug and optimizing its dose and duration to cure an infection while minimizing toxicity and conditions for selection of resistant bacterial strains. Applying an effective stewardship program will often decrease the overall cost of treatment, but this is not the primary goal of the program. Rather, antibiotic stewardship should be geared toward optimizing collective patient outcomes by ensuring that the entire antimicrobial armamentarium is appropriately utilized.

### Background

The emergence of antibiotic-resistant bacteria is a major challenge in the treatment of human infections. Inappropriate use of antibiotics contributes to the growing problems of resistance in health care facilities.

The medical community has responded to these conditions with the application of antibiotic stewardship or judicious-use programs. Antibiotic (or antimicrobial) stewardship programs are interventions designed to ensure that hospitalized patients receive the right antibiotic, the right route of administration, and the right dose at the right time for the right duration in order to prevent or cure infection while minimizing adverse events and emergence of resistance. Because this strategy generally leads to more rapid resolution of infection with minimal adverse events, in most cases it results in a reduction in treatment costs, although this is a primary goal of true antibiotic stewardship programs. Interventions to improve antibiotic use can be implemented in any health care setting—from outpatient to hospital to long-term care facility. Antimicrobial stewardship has been shown to be essential in the control of *Clostridium difficile* infections and the emergence of multidrug resistant organisms (MDROs).<sup>1</sup>

In 2007, the Infectious Disease Society of America (IDSA) and the Society for Healthcare Epidemiology of America (SHEA) released guidelines for developing an institutional program to enhance antibiotic stewardship.<sup>2</sup> According to IDSA and SHEA, effective antibiotic stewardship programs (ASPs) are evidence-based and can help improve patient care and be financially sustainable. IDSA/SHEA guidelines include several strategies:<sup>3</sup>

**Infection control programs** – The goal of the infection control program is to identify and reduce the risks of acquiring and transmitting infections among patients, staff, students, volunteers, contract service workers and visitors. In addition to considerations such as proper hygiene and patient management, an infection control program includes a surveillance program for patients and staff, in addition to education and consultation in infection prevention.

**Appropriate use audits** – Prospective audits of antibiotic use with direct interaction and prescriber feedback can result in reduced inappropriate use of antimicrobials.

**Formulary oversight** – Most hospitals have a Pharmacy and Therapeutics Committee (P&T), which can oversee appropriate antibiotic use through formulary availability or other methods, such as preauthorization or stepped-care.

**Guidelines and clinical pathways** – Development of evidence-based practice guidelines, which incorporate local microbiology and resistance patterns, can improve appropriate antibiotic utilization.

**Streamlining** – Streamlining or de-escalation of empirical broad-spectrum antibiotic therapy on the basis of culture results and the elimination of redundant combination therapy can more effectively target the causative pathogen and result in decreased antimicrobial exposure.

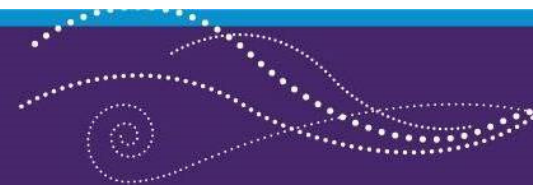
**Antibiotic cycling** – This strategy involves substituting one antibiotic for another in order to relieve selective pressure and reduce resistance to the restricted agent. Although antibiotic cycling has been employed as a strategy in some patients, no clinical evidence exists to recommend the routine use of antibiotic cycling by a health care facility as a means of preventing or reducing antibiotic resistance over a prolonged period of time.

**Antibiotic diversity** – Fundamentally, the ability to employ antibiotic stewardship programs rests on the concept of antibiotic diversity, which ensures that clinicians have access to a wide set of antibiotics to employ in balanced moderation. This avoids over-reliance on a narrow set of products, which then leads to a buildup of resistance, though the evidence of such strategies' effectiveness at decreasing resistance over the long term is equivocal. Thus, the continued introduction and availability of new antibiotics is critical to the ongoing management and treatment of infectious disease.

**Computer-assisted programs to improve antibiotic use** – Computer-based surveillance and tracking can allow for the efficient targeting of antimicrobial interventions, the tracking of antibiotic resistance patterns, and the identification of nosocomial infections and adverse drug events.

**Prescriber education** – Education is an essential element of any stewardship program and is designed to enhance and increase the acceptance of stewardship strategies. However, without the incorporation of other appropriate-use strategies such as those described





above, education alone can be only marginally effective in changing antibiotic prescription practices and has not demonstrated a sustained impact.

Pfizer and other pharmaceutical companies have developed and endorsed antibiotic stewardship strategies through the International Federation of Pharmaceutical Manufacturers and Associations (IFPMA). More details can be found on the IFPMA website at: <http://www.ifpma.org/innovation/anti-microbial-resistance.html>. Pfizer is also working with other nongovernmental organizations (NGOs) such as the Gates Foundation to develop effective stewardship strategies for the developing world.

Antibiotic stewardship programs are designed to mitigate the development and impact of antimicrobial resistance but will not eliminate the issue. Pfizer is working to help ensure successful and judicious antibiotic use through our efforts in medical education and global resistance monitoring. Pfizer has made significant investment in infectious disease research and development, focusing currently on preventive vaccines. Pfizer continues to maintain surveillance programs that report in vitro activity of clinical bacterial isolates searchable regions, bacteria type, type of infection, etc.

## Key Facts and Figures

- The economic burden created by antibiotic resistance in the United States is estimated at \$55 billion (\$20 billion in health service costs and \$35 billion in lost productivity) per year.<sup>4</sup>
- Antibiotic-resistant bacteria cause more than 2 million illnesses and at least 23,000 deaths each year in the U.S.<sup>5</sup>
- The National Action Plan for Combating Antibiotic-resistant Bacteria states that stewardship practices could prevent 619,000 infections and 37,000 deaths from antibiotic-resistant bacteria in the U.S. over five years.<sup>6</sup>
- Antimicrobial-resistant infections cause over 50,000 deaths annually in Europe and the U.S.; hundreds of thousands more die in other regions.<sup>7</sup>
- In the EU, Iceland and Norway, the burden of additional hospital care due to AMR infections was estimated to be approximately €1.6 billion in 2012.<sup>8</sup>
- Based on studies by KPMG and RAND Europe, a continued increase in resistance would reduce world GDP by 2-3.5 percent by 2050.<sup>9</sup>

## Pfizer's Position

Proper management of antibiotic use requires an evidence-based approach, prescriptively applied to discrete health care settings, as well as the individual patient's situation. Thus, it is necessary for infectious disease specialists, microbiologists, clinical pharmacists and other key caregivers to work together as a team. Pfizer routinely sponsors and conducts medical education outreach to healthcare providers through a variety of mechanisms, including medical symposia and Pfizer sponsored preceptorships, to ensure appropriate utilization of antibiotics and improve infection prevention and control. Pfizer recently partnered with the British Society for Antimicrobial Chemotherapy and the University of Dundee to launch the Massive Open Online Course (MOOC) on antimicrobial stewardship. The course helps health care professionals understand and address the global threat of antimicrobial resistance, focusing on how to responsibly use high-quality antibiotics safely in everyday practice. Over 5,000 healthcare professionals had completed the course, with over 15,000 registrants. Pfizer currently provides support to BSAC for translation of the MOOC into Chinese and other languages to enable broader global access to AMS training.

<sup>1</sup> Antimicrobial Stewardship Guidelines • CID 2007:44 (15 January).

<sup>2</sup> Policy Statement on Antimicrobial Stewardship by the Society for Healthcare Epidemiology of America (SHEA), the Infectious Diseases Society of America <http://www.shea-online.org/View/smld/428/ArticleID/141.aspx>.

<sup>3</sup> Dellit, TH et al. Infectious Disease Society of American and the Society for Healthcare Epidemiology of America Guidelines for Developing an Institutional Program to Enhance Antimicrobial Stewardship. Clin Infect Dis 2007;44:159-77.

<sup>4</sup> The economic burden of antimicrobial resistance. Why it is more serious than current studies suggest. 2013. [www.lshtm.ac.uk/php/economics/assets/dh\\_amr\\_report.pdf](http://www.lshtm.ac.uk/php/economics/assets/dh_amr_report.pdf).

<sup>5</sup> <http://www.cdc.gov/vitalsigns/stop-spread/index.html>.

<sup>6</sup> The National Action Plan for Combating Antibiotic-resistant Bacteria available at: [https://www.whitehouse.gov/sites/default/files/docs/national\\_action\\_plan\\_for\\_combating\\_antibiotic-resistant\\_bacteria.pdf](https://www.whitehouse.gov/sites/default/files/docs/national_action_plan_for_combating_antibiotic-resistant_bacteria.pdf).

<sup>7</sup> Antimicrobial Resistance: Tackling a Crisis for the Health and Wealth of Nations, The Review on Antimicrobial Resistance, December 2014 Report available at: [http://amr-review.org/sites/default/files/AMR%20Review%20Paper%20-%20Tackling%20a%20crisis%20for%20the%20health%20and%20wealth%20of%20nations\\_1.pdf](http://amr-review.org/sites/default/files/AMR%20Review%20Paper%20-%20Tackling%20a%20crisis%20for%20the%20health%20and%20wealth%20of%20nations_1.pdf).

<sup>8</sup> Ibid.

<sup>9</sup> Ibid.

