Minimizing Antimicrobial Resistance: The Key Role of the Infectious Diseases Physician

John E. McGowan, Jr.
Department of Epidemiology, Rollins School of Public Health of Emory University, and Department of Medicine (Infectious Diseases), Emory University School of Medicine, Atlanta, Georgia

(See the article by Sunenshine et al. on pages 934–8)

Antimicrobial resistance in bacteria is a threat to the viability of current health care systems [1, 2]. This impact comes in part from the increasing prevalence of bacteria resistant to multiple anti-infective agents (i.e., multidrug-resistant organisms) that infect patients in acute care hospitals [3]. A few bacterial organisms associated with infections in the health care setting now are completely resistant to all commonly used antimicrobial agents [4, 5]. Other multidrug-resistant organisms that were previously common only in acute care hospitals recently have been recovered in extended care facilities, ambulatory surgical units, and home health care and other health care settings [6–10]. In addition, drug-resistant organisms arising in the community now appear and spread in health care settings as well [11, 12].

Bacterial drug resistance has many consequences [1]. These include increased mortality and morbidity among patients and a reduction in the number of useful drugs for future generations of patients [13, 14]. Of additional concern is the economic impact of such infections [15, 16]. Drug-resistance is especially costly for health care systems in the United States and for the third-party payers that support such systems [17–20]. The incremental cost of caring for patients infected with drug-resistant organisms is sizeable [18, 19, 21]. Such costs are borne only in part by third-party payers, which often reimburse on the basis of head count, diagnosis-related groups, or other formulas unrelated to specific services provided to an individual patient. Thus, most costs associated with drug-resistant infections must be absorbed by the health care system itself. As the prevalence of multidrug-resistant organisms increases, these additional costs will become a greater and greater threat to the financial stability of health care systems, many of which are already struggling to survive.

The current problem of drug resistance has its genesis in many factors, including selection of drug-resistant mutants by exposure to antimicrobial agents, transfer of genetic determinants of resistance between bacterial strains, and clonal spread of drug-resistant strains among hospitalized patients within and between institutions [22, 23]. Thus, attempts to deal with resistance have embraced many different strategies (table 1). The infectious diseases physician (IDP) is the key person or a valuable resource for implementing most, if not all, of these strategies for minimizing the impact of resistance (table 1). This is true because there are several groups of stakeholders that must be included in efforts to deal with resistance in the health care setting. These target groups include prescribers, who need to be convinced that their individual prescribing actions have a cumulative link to resistance pattern; patients, who need to be convinced that their demands for antimicrobials also can affect selective pressure; health care administrators, who need to be convinced that actions to deal with resistance and improve antimicrobial use are cost-effective and needed; institutional thought leaders, who need to understand that the goal of antimicrobial monitoring programs is to attempt to improve use of antimicrobials rather than to control or restrict them; pharmacists, nurses, and laboratory personnel, who need to partner in programs to improve administration of antimicrobials (e.g., by monitoring and improving procedures for proper dosing, improving empirical therapy by providing more useful data to the prescriber at the time of empirical choice, and using protocols, such as switching drugs or stopping use of them, when infection is unlikely); antimicrobial use improvement and quality assurance groups, which need to advance programs to improve drug choice (e.g., by
promoting evidence-based practice guidelines, both in the hospital setting and in long-term care; and professional societies and the government, which need to consider the problem of industry withdrawal from antimicrobial research as a national and international crisis. The IDP, by nature of background, training, and status in the health care community, is the ideal person to bring these diverse stakeholders together in efforts to minimize resistance.

The influence of IDPs is especially prominent in 3 important areas. First, the prevalence of drug-resistant microorganisms in health care facilities is enhanced by poor compliance with infection-control standards. [24] IDPs are usually directors or members of infection-control programs within health care institutions, so they play an important role in minimizing the intrafacility and interfacility spread of drug-resistant organisms. Second, the crucial need for development of new antimicrobials is currently being hindered by withdrawal from the development of antimicrobial drugs by many pharmaceutical manufacturers, so that they can concentrate on developing drugs for other indications with higher profit potential [25]. IDPs, through their professional society, the Infectious Diseases Society of America (IDSA), are playing a major role in bringing this growing threat to the attention of the government and the public [26]. Third, antimicrobial resistance is fueled by excessive antimicrobial use [22, 27]. Thus, careful, discriminating use of antimicrobial agents remains the keystone for minimizing the problem of resistance, although it is not the only control measure needed [28, 29]. This need for effective antimicrobial stewardship must be communicated more effectively to prescribers [30]. IDPs can best provide such communication, regardless of whether there is a program in place for control of the use of selected antimicrobial agents.

This last point about programs for improving antimicrobial use practices is explored in detail by the article in this issue by Sunenshine et al. [31]. These authors surveyed a convenience sample of IDSA members (i.e., those participating in the Emerging Infectious Diseases Network [EIN]) on a number of issues related to management of antimicrobial use. Several useful insights arose from the replies that they received.

The great majority of the respondents agreed that inappropriate antimicrobial use is the most important factor contributing to antimicrobial resistance in the health care setting. They also agreed that IDPs should be involved in decisions about antimicrobial use in health care institutions. Approximately one-half of the respondents reported that they practice in settings where an approval process is required for use of ≥1 antimicrobial agent. Surveyed IDPs from hospitals without approval mechanisms were fairly split in their advocacy for approval practices. However, in the surveyed institutions with such procedures in place, IDPs usually are involved in the process, whether these physicians practice in an adult or pediatric institution. The presence of restriction policies was reported more frequently by respondents in pediatric settings and from hospitals in the mid-Atlantic and Northeastern areas. The authors point out that this survey cannot be taken as representative of the situation in the country as a whole because of potential biases in those surveyed and those who replied to the survey. Were these data representative of the country as a whole, it would now seem useful to further explore reasons for the greater receptivity to these policies in these locales. It is not clear whether this geographic localization was related to other variables, such as the type of hospital (teaching vs. nonteaching). Analysis of possible colinear relationships like this would require multivariate analysis, which was not reported.

Almost one-half of the survey respondents believed that their participation in

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Table 1. Measures to minimize antimicrobial resistance and the role of the infectious diseases physician in each.

<table>
<thead>
<tr>
<th>Measure</th>
<th>Role of the infectious diseases physician*</th>
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<tbody>
<tr>
<td>Promoting use of vaccines to protect against multidrug-resistant organisms (e.g., Streptococcus pneumoniae) [35]</td>
<td>Promoting use of relevant currently available vaccines</td>
</tr>
<tr>
<td>Validating laboratory susceptibility testing methods, especially for new resistance mechanisms that may not be detected by current methods or for which accurate detection methods are costly or time-intensive [36-38]</td>
<td>Helping arrange for availability of appropriate vaccines</td>
</tr>
<tr>
<td>Emphasizing infection-control measures to prevent clonal spread of drug-resistant organisms in health care settings [39]</td>
<td>Helping develop and comply with infection-control policies and practices dealing with control of drug-resistant organisms</td>
</tr>
<tr>
<td>Benchmarking of patterns of resistance and antimicrobial use in a health care institution [40, 41]</td>
<td>Helping arrange that appropriate summaries of use and resistance are available and that benchmarking is performed in the practice setting</td>
</tr>
<tr>
<td>Facilitating inclusion of control of antimicrobial resistance as a focus of educational programs for prescribers and other health care workers, health care administrators, and patients [42]</td>
<td>Providing appropriate materials and perspectives for these educational efforts in the institution</td>
</tr>
<tr>
<td>Decreasing antimicrobial selective pressure by improving antimicrobial use practices [3, 34, 43]</td>
<td>Providing appropriate materials and perspective for these efforts in the institution, and participating in programs to improve antimicrobial use</td>
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<tr>
<td>Encouraging development of new antimicrobials to fill therapy gaps</td>
<td>Supporting efforts to achieve this through the professional society (Infectious Diseases Society of America) and individual efforts, if appropriate</td>
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* Infectious diseases physicians often direct or participate in institutional departments, teams, or committees addressing these issues. In addition, some infectious diseases physicians conduct research related to these topics.
attempts to improve antimicrobial use practices would result in “reprisals” by other practicing physicians, in the form of decreased requests for consultation. This answer illustrates one of the most difficult and frustrating aspects of trying to improve antimicrobial use practices—the impression that other practicing physicians might consider efforts to control drug resistance as an unwarranted intrusion on their independence. To deal with such an attitude, one might need to address the impact that resistance brings to the health care setting (discussed above), emphasize the cumulative impact that individual prescribers make on overall antimicrobial selective pressure within a given hospital or other health care setting [27, 32], summarize the many studies suggesting that prescribing practices in most hospitals are lacking [33], and detail the many benefits that accrue—not just to health care systems, but also to patients—from improved antimicrobial use and minimization of the role of drug-resistant organisms [3, 29, 34]. A key to these activities is making it clear that the steps being taken to improve use result from decisions and consensus by multidisciplinary teams, which include practice leaders in the hospital, rather than from arbitrary decisions by IDPs [22].

One further point is a puzzle: how can one explain the finding in this EIN survey that most of the IDPs working to deal with drug resistance as an unwarranted intrusion on their independence. To deal with such an attitude, one might need to address the impact that resistance brings to the health care setting (discussed above), emphasize the cumulative impact that individual prescribers make on overall antimicrobial selective pressure within a given hospital or other health care setting [27, 32], summarize the many studies suggesting that prescribing practices in most hospitals are lacking [33], and detail the many benefits that accrue—not just to health care systems, but also to patients—from improved antimicrobial use and minimization of the role of drug-resistant organisms [3, 29, 34]. A key to these activities is making it clear that the steps being taken to improve use result from decisions and consensus by multidisciplinary teams, which include practice leaders in the hospital, rather than from arbitrary decisions by IDPs [22].

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