# Improving Antibiotic Use Has Become Essential-Can Surgery Lead the Way?

John E. McGowan, Jr., MD

The past few years have seen a remarkable increase in antimicrobial resistance of organisms that were susceptible to many drugs a few years ago.[1] Worse, some organisms have developed resistance to drugs that have worked for years.[2,3] For the first time in many decades, we face the specter of organisms for which no adequate chemotherapy exists. For example, enterococci have developed resistance to β-lactams, aminoglycosides and now vancomycin.[4] How to treat serious infection caused by enterococci that acquire all three of these resistance mechanisms is totally unclear. These developments mean that we now are facing a precarious time in attempting to keep patients with serious infections alive.

## INCREASING RESISTANCE MEANS ANTIBIOTIC USE MUST BE OPTIMAL

Antimicrobial resistance is spawned in large measure by the selective pressures of antibiotic use.[3,5,6] Overuse and misuse of newer, broad-spectrum antimicrobials has led to increases in nosocomial infections caused by the very organisms in which resistance is becoming a threat, like the enterococcus.[7] Attempts in the past to improve use of antimicrobials were motivated by altruism and the financial drain of unneeded antibiotics. Attempts to achieve better use now should be dictated by the increasing threat of resistance, which has implications for patients and society beyond that of economics.[2,5,8] Thus, efforts must be redoubled to make sure that antimicrobials are used as appropriately as possible.[9,10] The problem is most important in patients with compromised host defenses, who make up an increasing proportion of hospitalized patients.

## EFFORTS TO IMPROVE USE HAVE FALLEN SHORT

Despite this pressing need, U.S. prescribers continue to use anti-infectives poorly.[11] For example, some newer antimicrobial agents are especially valuable because they work in specific situations covered by no other drug. One of these settings is the use of ciprofloxacin for outpatient therapy of patients whose infecting organism will respond to no other oral regimen. The need seems obvious for careful, discriminating use of this and similar agents, so that the drugs will retain their effectiveness for these unique applications. Yet, a recent report describes "widespread inappropriate use" of this drug, and describes not one, but several different patterns of misuse.[12]

In the United States, the pharmaceutical industry still promotes heavily the idea of "doctor, you are the boss and you should be at your ease—make absolutely sure that your patient's infection is cured by giving a drug that will kill the likely pathogens and a whole host of unlikely ones as well."[13] Such pandering simultaneously to the physician's ego and fears[14] has been and remains effective in selling many grams of expensive broad-spectrum antibiotics. A recent British editorial notes that "the time has come for the medical profession to moderate its insistence on clinical freedom to prescribe what it likes when it likes."[10] For patients with compromised host defenses, a

*From the Department of Pathology and Laboratory Medicine, Emory University School of Medicine, and the Clinical Microbiology Laboratory, Grady Memorial Hospital, Atlanta, Georgia.*

*Address reprint requests to John E. McGowan, Jr., MD, Clinical Laboratories (Box 26248), Grady Memorial Hospital, 80 Butler Street, Atlanta, GA 30335.*

*McGowan JE Jr. Improving antibiotic use has become essential-can surgery lead the way?* Infect Control Hosp Epidemiol. *1990;11:575-577.*

paper from Stanford has called for "uniform antibiotic control policies that are prospectively reviewed" to deal with excessive antibiotic use.[15] On the whole, however, healthcare authorities and the public in the United States still continue to allow indiscriminate use of these important drugs by any and all physicians or other prescribers, whether they are skilled or unskilled at such prescriptions.

## SURGEONS—A CRUCIAL CONSTITUENCY

Antibiotic prescribers of particular importance are the surgeons (who, in this discussion, include obstetricians and gynecologists). The impact of their actions is considerable because they oversee so much of the antimicrobial therapy that is given. Perioperative antimicrobial prophylaxis (PAP) accounts for more than one of every three antibiotic prescriptions, and the dollar value of antibiotics used for this purpose is sizable-an aggregate expenditure of several hundred million dollars per year in the United States.[16] The benefits that PAP produce also are of substantial economic importance, because it is expensive to deal with postoperative infections. Hospitals in the United States usually recover a small net gain for surgical procedures; this profit is lost when the patient develops postoperative infection.[17] PAP "may account for a substantial portion of hospital pharmacy antibiotic use that is regarded as inappropriate,"[18] so it deserves attempts to improve use. However, even if there were no cost rationale for its review, analysis of PAP still would be necessary because of its potential for selection of resistant organisms.[18]

## IMPROVING ANTIBIOTIC USE IN SURGERY-AN EXAMPLE

The article by Everitt, et al. in this issue[19] exemplifies the results that can be achieved today in a surgical setting. These investigators blended a number of features to improve antibiotic use in one aspect of obstetric surgery. Some of the forces they harnessed are common to most hospitals today. The setting for their program was a hospital subject to the requirements of the Joint Commission on Accreditation of Healthcare Organizations (JCAHO), which recently has emphasized better antibiotic prescribing. It also seems likely that the investigators made the administrators at the hospital aware that antibiotics are expensive and diminish the fixed amount of reimbursement provided for patient care under today's prospective payment schemes. The area of antibiotic prescribing being targeted, PAP for cesarean section, was one for which clear data exist about proper use. No physicians or surgeons are trying to take poor care of their patients; convincing objective data readily can change prescribing practices.[6] The ability to improve antibiotic use for this indication also has been documented elsewhere.[20]

Beyond these factors, the program included some key steps to success that took advantage of local resources. First, the plan incorporated a number of different tactics (antibiotic order forms, meetings with department leaders, etc.). Second, the investigators made a strong effort to achieve consensus agreement by the surgical prescribers with the guidelines and goals of the study before beginning the campaign. Third, the investigators assisted the prescribers themselves to devise and carry out measures to achieve the goal, rather than trying to inflict a new set of rules and regulations from outside the group writing the prescriptions. Most important, perhaps, the investigators recognized that they were working with surgeons, a group of physicians who have a strong sense of united effort, and who pull together behind their leaders. Their tactics of influencing leaders were the results of this perceptive observation.

The project ended in success, measured by dramatic changes in pattern of drug use and by the estimation of impact on direct administration costs of using first-generation rather than second-generation cephalosporins. Measuring other economic aspects would have increased the apparent financial gain.[16] No estimate of the impact on resistance was measured here. Better ways are needed to measure this[6,16]; the costs of resistance may be greater than has been documented to date.[5,21]

Everitt and colleagues carefully state that the methods they used for this study of PAP in obstetric surgery "may be applicable" to other types of antimicrobial use and at other institutions.[19] The caution is commendable, because successful tactics at the Beth Israel Hospital in Boston may not be the exact steps for the rest of us to take. Most hospitals operate in the same regulatory environment. Beyond this, local situations vary markedly, so approaches must vary as well. The useful general lesson from this article is that the authors took advantage of the resources present at their hospital, building their plan to the institution rather than trying to make the institution conform to their plan. As a result, this cooperative effort by a group of concerned workers achieved a clear and documented improvement. This lesson should be of value to us all as we try to mount our counteroffensive against the wily and ingenious resistant microorganisms of the 1990s.

## REFERENCES


1. Parry MF. Epidemiology and mechanisms of antimicrobial resistance. Am *J* Infect Control. 1989;17:286-294.
2. Lambert HP. Clinical impact of drug resistance. *J Hosp Infect*. 1988;11(suppl A):S135-S141.
3. O'Brien TF, Task Force 2. Resistance of bacteria to antibacterial agents: report of Task Force *2. Rev Infect Dis*. 1987;9(suppl 3):S244-S260.
4. Shlaes DM, Binczewski B. Enterococcal resistance to vancomycin and related cyclic glycopeptide antibiotics. *Eur J Clin Microbiol Infect Dis*. 1990;9:106-110.
5. Liss RH, Batchelor FR. Economic evaluations of antibiotic use and resistance-a perspective: report of Task Force 6. *Rev Infect Dis*.

1987;9(suppl 3):S297-S312.
6. McGowan JE Jr. Minimizing antimicrobial resistance in hospital bacteria: can switching or cycling drugs help? *Infect* Control. 1986;7:573-576.
7. Magnussen CR, Cave J. Nosocomial enterococcal infections: association with use of third-generation cephalosporin antibiotics. *Am J Infect* Control. 1988;16:241-245.
8. Holmberg SD, Solomon SL, Blake PA. Health and economic impacts of antimicrobial resistance. *Rev Infect Dis*. 1987;9:1065-1078.
9. Dans PE, Charache P. Inappropriate antimicrobial use in patients with positive blood cultures. *Am J Med*. 1990;88:202.
10. Gould IM. Control of antibiotic use in the United Kingdom. *J Antimicrob Chemother*. 1988;22:395-401.
11. Dunagan WC, Woodward RS, Medoff G, et al. Antimicrobial misuse in patients with positive blood cultures. *Am J Med*. 1989;87:253-259.
12. Frieden TR, Mangi RJ. Inappropriate use of oral ciprofloxacin. *JAMA*. 1990;264:1438-1440.
13. Lettau LA. Antibiotics 1999. *Ann Intern Med*. 1989;110:850.
14. DeMaria A Jr. Peace of mind and the cost of treating infection. Arch Intern *Med*. 1984;144:1369-1370.
15. O'Hanley P, Easaw J, Rugo H, Easaw S. Infectious disease management of acute leukemic patients undergoing chemotherapy: 1982 to 1986 experience at Stanford University Hospital. *Am J Med*. 1989;87:605-613.
16. McGowan JE Jr. Cost and benefit in perioperative antibiotic prophylaxis-methods for economic analysis. *Rev Infect Dis*. *In* press.
17. Boyce JM, Potter-Bynoe G, Dziobe KL. Hospital reimbursement patterns among patients with surgical wound infections following open heart surgery. *Infect Control Hosp Epidemiol*. 1990;11:89-93.
18. Ehrenkranz NJ. Containing costs of antimicrobials in the hospital: a critical evaluation. *Am J Infect Control*. 1989;17:300-310.
19. Everitt DE, Soumerai SB, Avorn J, Klapholz H, Wessels M. Changing surgical antimicrobial prophylaxis practices through education targeted at senior department leaders. *Infect Control Hosp Epidemiol*. 1990;11:578-583.
20. Zhanel GG, Gin AS, Przybylo A, Louie TJ, Otten NH. Effect of interventions on prescribing of antimicrobials for prophylaxis in obstetric and gynecologic surgery. *Am J Hosp Pharm*. 1989;46:2493-2496.
21. Phelps CE. Bug/drug resistance: sometimes less is more. *Medical* Care. 1989;27:194-203.