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FROM THE EDITOR

What Is Antimicrobial Stewardship?

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Last month's issue of the *AMA Journal of Ethics* explored antimicrobial resistance (AMR) as a complex challenge emblematic of the interconnectedness of living systems—from the smallest microorganisms to enduring global ecosystems—all linking back to human action, health, and disease. It is this interconnectedness that demands a unique, collaborative approach to finding solutions. This issue examines antimicrobial stewardship, a response to the threat of AMR. Antimicrobial stewardship is a tool kit of structured interventions generally operating at the same levels as AMR, with individual-, clinician-, and **patient-level tools**, organizational tools, and social and public health tools.¹ The purpose of stewardship at every level is to guide the use of antimicrobials—but toward what end?

The Centers for Disease Control and Prevention's Core Elements of Antibiotic Stewardship recommendations highlight 3 ends of antimicrobial stewardship programs: "to effectively treat infections, protect patients from harms ... and combat antibiotic resistance."² We know that antimicrobial use drives AMR. This is a descriptive, scientific claim, supported by high-quality empirical data.³ But antimicrobial stewardship seeks not to end antimicrobial use but rather to target "misuse," "overuse," or "inappropriate" or "irresponsible" use of antimicrobials. These characterizations of certain examples of antimicrobial use make normative claims—claims about what is right or wrong, good or ... not so good. The ethical practice of antimicrobial stewardship depends on defining "good" antimicrobial use (in relation to misuse or overuse, for example), building consensus around those definitions, navigating the uncertainty inherent in antimicrobial decision making, and balancing good antimicrobial use with other values like patient and **professional autonomy**. If normative characterizations of antimicrobial use are incompletely defined and imperfectly understood, so, too, are the conceptual frameworks for balancing the diverse ends of antimicrobial stewardship. As you explore this issue, be mindful of the language used to describe both the values of antimicrobial stewardship and the approaches to resolving competing values.

- **Stewardship as correctness.** In its simplest form, antimicrobial stewardship promotes the correct—that is, the *empirically* correct—use of antimicrobials via clinicians choosing an antimicrobial that is effective against the target microorganism and able to penetrate the affected body tissue; administering that drug at a dose appropriate to the patient's condition, size, and metabolism; and continuing the treatment for the duration needed to achieve the therapeutic goal.⁴ Certainly, there are empirically wrong choices for a given therapeutic goal, and stewardship seeks to avoid them. But the sheer complexity of patient, disease, and drug characteristics may make it hard to identify a single "right" or "best" choice based only on empirical data.

- *Stewardship as refinement.* Presented with many at least passable options, stewardship may seek to refine antimicrobial use on the margins by using small, incremental changes or nudges to fine-tune antimicrobial decision making. For example, a stewardship program might implement reminders about antimicrobial dose adjustment for kidney function in the electronic health record.⁵ This perspective frames stewardship as subtle, gentle, and minimally intrusive. But is marginal refinement a sufficient response to the threat of AMR?
- *Stewardship as optimization.* Taken further, refinement may become optimization. A kind of quantifiable perfection, optimization is less gentle than refinement and more ambitious. Instead of just any step in the right direction, optimization asks us to go as far as we can toward “ideal” or “perfect” antimicrobial use. But optimization depends on a unified understanding of the good and bad aspects of antimicrobial use. As prevalent as the language of optimization is in the conversation about antimicrobial stewardship, such a unified understanding is elusive. We cannot simultaneously optimize 2 competing goods—maximization of therapeutic benefits of antimicrobials *and* minimization of the risks of emergence of resistance, for example, without agreeing how these goods should be weighed against one another.
- *Stewardship as moderation.* Perhaps rather than optimization, stewardship demands moderation. Moderation is a virtue between the opposing extremes of excess and austerity. Less quantitative and more subjective than optimization, moderation in antibiotic use might be akin to other virtuous traits and behaviors: wisdom, patience, and courage. We see these deeply rooted character traits in the thoughts, speech, and actions of our role models, who have aspired to and practiced these virtues over long and distinguished careers, such that they have become effortless. Instilling and nurturing these virtues has long been a priority of the apprenticeship model of medical training.⁶ But, like other virtues, the virtue of moderation might appear different to different observers. Some might see moderation in the choice of oral rather than intravenous antibiotics, others in the use of an intravenous antibiotic with a narrower spectrum like oxacillin rather than in an oral antibiotic with a broader spectrum like levofloxacin. Antimicrobial stewardship **calls upon health professionals** in diverse roles at *all* levels of training to embrace new data and strive for moderation, meaning that stewardship knowledge is not only transmitted from expert to apprentice but also from peer to peer and even from junior to senior.
- *Stewardship as conservation.* Antimicrobial stewardship can be seen as a part of an even larger paradigm shift, a focus on sustainability and conservation. Much as human activity has driven climate change, habitat destruction, and extinction, human activity (in the form of antimicrobial use) has driven AMR. Antimicrobial stewardship, then, can be seen as a conservation intervention whose purpose is to better preserve the current microbe and antimicrobial ecology for years to come.⁷ Just as environmental conservation seeks to conserve vanishing habitats and waning species so that future generations can enjoy a world of rich biodiversity and stable ecosystems, so antimicrobial conservation seeks to conserve effective treatments for diseases so that future generations can enjoy a world where common infections are still treatable and not lethal and where treatments—elective surgery, chemotherapy, organ transplantation—potentially complicated by infections are still safe and feasible. This focus on the future demands change, often sacrifice, in the present. But while it may seem reasonable to demand sacrifices of convenience—such as

many single-use plastics or vanities like private jets and yachts—delineating ethical “sacrifices” in health is more complicated.

In this issue of the *AMA Journal of Ethics*, contributors explore what antimicrobial stewardship is and suggest ethics’ pivotal roles in antimicrobial stewardship scholarship, practice, and advocacy.

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