Shifting the Paradigm for Promoting Appropriate Antibiotic Use

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This issue of JGIM includes two studies examining the effects of different diagnostic strategies on antibiotic treatment of acute respiratory tract infections. In Litvin et al., a computerized decision support tool (CDS) based on established clinical practice guidelines was used by 39 volunteering clinicians with 38,592 office visits over a 27-month period.¹ While participating practice sites demonstrated a highly variable reduction in use of broad-spectrum antibiotics for these infections, these sites did not significantly reduce their use of antibiotics overall or for specific target conditions. Similarly, in the observational study by Nakhoul and Hickner, use of a point-of-care DNA probe for group A streptococcus as a second-step test to confirm negative rapid test results identified as positive only 6 % of the initial rapid test negative patients.² The authors concluded that management was altered in only 3 % of 15,555 patients who received the DNA test—at a cost of \$1.8 million. Perhaps even more alarming was the antibiotic treatment of 48 % of patients who had a negative rapid test as well as a negative DNA confirmatory test.

These two studies are now part of a relatively large body of literature that has highlighted the persistent problem of poor quality of antibiotic use in ambulatory care despite the design and testing of a range of strategies to improve decision making in this area. Most investigators have focused on reducing inappropriate overuse of antibiotics for non-bacterial, self-limited infections. Of course, the other side of this equation is inappropriate underuse; for example, the decision to withhold antibiotics in situations when an antibiotic prescription would lead to improved patient outcomes. Traditionally, antibiotic underuse is defined as the failure to prescribe antibiotics for patients with demonstrated bacterial infections. And yet, there is remarkably little evidence that antibiotic therapy improves clinical outcomes for patients with signs and symptoms of bronchitis, pharyngitis, and sinusitis, which we collectively label acute respiratory infections (ARIs), even when appropriate cultures reveal pathogenic bacterial organisms. A paradigm shift is needed about when to use antibiotics for

ARIs—one that focuses on improvement in clinically meaningful, patient-centered outcomes rather than on microbiological eradication.

In contrast to these two new studies, previous studies incorporating decision support or diagnostic test strategies have been successful at reducing overall antibiotic use for ARIs, although effect sizes are generally modest when compared with the overall size of the quality gap.^{3–7} The inconsistent and modest impact of strategies to reduce inappropriate antibiotic prescribing reflect at least three broad issues: 1) the heterogeneity of clinical settings where antibiotics are prescribed for ARIs (e.g., emergency departments vs. primary care practices); 2) the importance of multidimensional interventions as opposed to reliance on single component, magic bullet strategies; and 3) the requirement for implementation strategies that translate successful interventions into real world practice improvement. In terms of site heterogeneity, it is clear that the barriers to prescribing improvement vary across clinical settings and therefore require different strategies.^{8,9} Strategies that focus on diagnostic uncertainty (as addressed by testing strategies) will have less impact in settings where the barriers relate more to patient expectation or practice efficiency and work flow. This probably explains part of the reason for the attenuated response in primary care practices to a clinical algorithm that induced much greater improvement in emergency departments—where rapid triage and diagnosis of clinical syndromes lies at the core of clinical care.¹⁰

With respect to the strategies examined by both Litvin and Nakhoul, while both are feasible interventions with established scalability, neither appears to have included components addressing patient attitudes and expectations for antibiotics which previous studies have shown are important to incorporate in strategies for reducing overall antibiotic use. The problem with patient and provider educational interventions, particularly those shown to be most effective (such as academic detailing for providers or motivational interviewing for patients), is that they tend to be difficult to bring to scale. Social marketing campaigns have shown some success as scalable approaches to health promotion and behavior change in this arena. A mass media campaign guided by social marketing experts was associated with a decrease in community-level antibiotic use—

driven mostly by changes in public behavior (reduced office visits) rather than by changes in prescribing.⁴ A cost analysis of this campaign would make it cost-neutral if not cost-saving; however this investment requires cooperation and commitment across payers and stakeholders that has been difficult to achieve.

Finally, a structured approach based on implementation science principles suggests possible reasons for the recalcitrant nature of antibiotic prescribing practices in the US. Based on a “checklist” we conceived from the frameworks of Shortell and Damschroder, one can see that the problem of antibiotic overuse suffers from lack of an observable connection between a change in prescribing behavior and the benefits of that change (e.g. reduced patient side effects and decreases in antibiotic resistance levels), lack of organizational/stakeholder readiness for change, and the low compatibility with existing values and social norms of clinical staff and patients.^{11–13} It is increasingly clear that the success of diagnostic algorithms, educational programs, and decision support tools will depend on the local context. The need for local tailoring of interventions targeting antibiotic overuse creates fundamental challenges to our traditional scientific approach, testing standardized interventions across multiple sites to define a common (or average) effect size. And yet, in much the same way that patient treatment is increasingly individualized, we need to design and evaluate strategies that allow local adaptation of interventions that promote appropriate antibiotic use.

While national organizations and stakeholders such as the CDC, NIH, FDA, WHO, and IOM recognize the significance of overuse of antibiotics as a major public health concern, the delivery system stakeholders and individuals that control the behavior locally have not adequately engaged. The trade-offs and exchanges for changing behavior at the individual patient-clinician level are not aligned with the larger societal benefits. Ten years ago, we found this to be true in a national survey of physicians; and it appears to continue to be the case today.¹⁴ From this perspective, it appears that sustainable reductions in the overuse of antibiotics in ambulatory practices will require greater investment from local stakeholders in order to align the culture, context and accountability of judicious antibiotic use across clinicians, patients and the public.

Conflict of Interest: The authors declare that they do not have a conflict of interest.

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