

Extending Antimicrobial Stewardship to All Hospitalized Children: The Time Is Now

Russell J. McCulloh, MD, Laura E. Norton, MD, Jennifer L. Goldman, MD

Antimicrobial resistance is a global threat to human health regardless of age or geography,¹ and the most rapidly modifiable cause for antimicrobial resistance is antimicrobial use.² In the United States, 1287 antibiotic prescriptions are written for every 1000 children 0 to 2 years of age annually, up to half of which are inappropriately prescribed or completely unnecessary.³ Antimicrobial exposure is not benign and may result in far-reaching and lifelong ramifications for child health and development, including risks of adverse drug events,⁴ *Clostridium difficile* infection,⁵ and long-term risks for developing obesity.⁶

Given the impact of inappropriate antimicrobial use on human health, it is no surprise that antimicrobial stewardship is an emerging focus of national and international health agencies⁷ and regulatory agencies, such as The Joint Commission.⁸ In the United States, laws mandating the development and implementation of antimicrobial stewardship programs (ASPs) have already been passed in California and Missouri. As stated in the Missouri law, "each hospital and ambulatory surgical center, excluding mental health facilities, shall establish an antibiotic stewardship program for evaluating the judicious use of antibiotics, especially antibiotics that are the last line of defense against resistant infections."⁹ Hospitals that treat both children and adults may face greater challenges to implementing ASPs than freestanding children's hospitals because their programs must encompass a broader array of stakeholders and clinical concerns.

Currently, the foundation of hospital-based ASPs has been centered on physicians and clinical pharmacists trained in infectious diseases (ID). Identified as effective stewards, this combined team has been accepted as the ideal leaders of ASPs. However, as recognized in the Infectious Diseases Society of America ASP guidelines,¹⁰ a traditional physician-pharmacist team may not be available on-site at all facilities. Thus, alternative approaches to review and optimize antibiotic use will need to be considered, including consultation with an ID expert outside of the institution. This may be extremely applicable to acute access or smaller facilities outside of the academic realm that will be expected to meet ASP mandates. Engaging health care providers that have not traditionally been identified as stewards will be critical to lead the charge at medical sites nationwide.

In this issue of *Hospital Pediatrics*, Lighter-Fisher et al¹¹ report their experience developing and implementing a pediatric ASP within a larger health system that cares for both adults and children. The program developed at their institution relies on a combination of prospective audit and feedback, a well-studied and effective method of

www.hospitalpediatrics.org

DOI:<https://doi.org/10.1542/hpeds.2017-0102>

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Address correspondence to Russell J. McCulloh, MD, Department of Pediatrics, Children's Mercy Hospital, 2401 Gillham Rd, Kansas City, MO 64108. E-mail: rmcculloh@cmh.edu

HOSPITAL PEDIATRICS (ISSN Numbers: Print, 2154-1663; Online, 2154-1671).

FINANCIAL DISCLOSURE: The authors have indicated they have no financial relationships relevant to this article to disclose.

FUNDING: No external funding.

POTENTIAL CONFLICT OF INTEREST: The authors have indicated they have no potential conflicts of interest to disclose.

Dr McCulloh conceptualized and wrote the commentary and supervised edits; Drs Norton and Goldman helped write the rough draft of the commentary and reviewed and revised the manuscript; and all authors approved the final manuscript as submitted.

Opinions expressed in these commentaries are those of the author and not necessarily those of the American Academy of Pediatrics or its Committees.

Department of Pediatrics,
Children's Mercy Hospital,
Kansas City, Missouri

improving antimicrobial use,¹² as well as institutional clinical practice guidelines for managing certain common infections, which can drive usage of specific antimicrobial agents.¹³ The staffing components of the authors' program reflects the critical role that pharmacists play in successful ASPs.¹⁴ Conspicuously absent in their program is a "practitioner" (assumedly non-ID and/or nonphysician) which is explicitly recommended in the Joint Commission standard. Smaller hospitals will likely find the obverse conundrum in which ID and epidemiology support may be unavailable on-site, necessitating the creation of a consultancy arrangement with another institution for such expertise and/or the use of telemedicine to fill the required roles of pharmacy or ID specialists. Pediatric hospitalists may be the natural fit to fill a void in hospitals in which pediatric ID specialists are unavailable to collaborate with experts and implement stewardship strategies locally.¹⁵ Arranging such services requires the explicit support of hospital leadership, another necessary component set forth in the Joint Commission standard.

Lighter-Fisher et al¹¹ also report on 2 metrics that are relevant for an ASP to monitor: total antimicrobial utilization and length of therapy. Antimicrobial utilization provides systems-level data that are relevant to a hospital's bottom line and can be standardized to patient volume, allowing for benchmarking across institutions.¹⁶ Length of therapy provides insight into the impact of specific stewardship interventions on patient care. Neither measure is clearly associated with changes in antimicrobial resistance patterns, but utilization and length of therapy serve as excellent process and outcome measures to assess the effectiveness of ASP activities. The selection of targeted outcome measures is population specific and must be considered when determining the most effective strategy to measure ASP outcomes. For instance, *C difficile* rates are higher in adults, and trends of inappropriate antibiotic use and *C difficile* rates may be more easily measured in adults compared with children. Thoughtful consideration of ASP outcomes is an important part of stewardship development and tracking. Monitoring

trends in bacterial susceptibility patterns, which to our knowledge Lighter-Fisher et al¹¹ have begun, may provide evidence of an ASP's impact long-term, but it is important to note that most antibiotics are prescribed outside the hospital setting, thus diluting the effect that more judicious antimicrobial use in hospitals may have. Future initiatives to extend ASPs beyond the hospital walls and to report regional data on antibiotic resistance will likely improve our ability to determine if ASPs are having a desired effect on the prevalence of antimicrobial-resistant organisms.

Lighter-Fisher et al¹¹ provide critical insight into the frequency and nature of ASP interventions conducted in hospitalized children at non-freestanding pediatric health centers. Previous reports in freestanding children's hospitals found that most ASP recommendations were to discontinue or limit the duration of antimicrobial therapy,¹⁷ which comprised a minority of interventions in the current study. Additionally, the authors report a significant increase in ID consultations, which, depending on the condition, may be beneficial,¹⁸ but this phenomenon may be institution specific, given previous reports.¹⁹ Lighter-Fisher et al¹¹ also found that 88% of recommendations made by the ASP were followed, which supports the experience of ASPs at freestanding children's hospitals.¹⁷ This finding also supports the assertion that prospective audit and feedback is not only effective in modifying behavior but is also typically well received by prescribing providers.²⁰

ASPs are designed to help clinicians make better near-term decisions when prescribing antibiotics and other antimicrobial agents. For many centers, including children's units within larger academic medical centers, the increasing availability of rapid bedside diagnostic tools for viral illnesses and molecular methods of determining bacterial species in blood cultures provides another avenue to improve antimicrobial prescription practices.²¹ When it takes only hours to determine if a blood culture result is positive for a contaminant, there is little reason to subject children to costly revisits

to the emergency department, repeat blood cultures, or empirical antibiotics. It is incumbent on hospitalists, ID providers, pharmacists, and other health professionals to devise practical approaches to best use these newer diagnostic technologies to enhance clinical decision-making.

For hospitalists practicing in smaller academic or community settings, Lighter-Fisher et al¹¹ provides a pragmatic approach to implementing basic aspects of an ASP outside of a freestanding children's hospital. It is up to hospitalists to adapt these lessons to their own settings and to share their experiences with their colleagues. Many hospitalized children are cared for outside of freestanding children's hospitals; the time for pediatric ASP at all hospitals is now.

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Hospital Pediatrics 2017;7;559

DOI: 10.1542/hpeds.2017-0102 originally published online August 16, 2017;

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