

COMMENTARY

Are you “smart prescribing” antibiotics in your surgical practice?

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As a surgeon, why should I care about “smart prescribing”?

According to a 2022 publication in *Lancet*, antimicrobial resistance represents a major worldwide human health threat with an estimated 4.95 million deaths of which 1.27 million deaths were attributable to bacterial AMR in 2019 [1]. The CDC recently revised the burden estimate in the US showing that more than 2.6 million antibiotic-resistant infections with nearly 44,000 deaths have occurred each year since the 2013 report was published [2].

Moreover, antibiotic resistance is a challenge for modern health care practice, impacting common surgical procedures such as joint replacements, organ transplants, cesarean section, and many more. Patients who have surgery are at risk for surgical site infections, and without effective antibiotics to prevent and treat surgical infections, would be at increased risk. Given that oral antibiotic prescribing by surgeons account for ~7% of all outpatient prescriptions [3], the selection of the appropriate antibiotic by the surgery team becomes of primary importance.

What’s the scope of the problem contributing to antibiotic resistance?

Surgical site infections account for 20% of all healthcare-associated infections [4], with an estimated annual cost of \$3.3 billion, extending length of hospital stay by 9.7 days, with the associated hospitalization cost increased by more than \$20,000 per admission [5,6].

In surgical care, most of the clinical interventions for a patient are performed by several teams of healthcare professionals. The surgical teams must balance appropriate prophylactic antibiotic prescribing with post-operative monitoring and evaluation and employ shared decision making. Since the surgical teams include not only the on-site surgical team (including surgeons, nurses, anesthesiologists, and resident infectious disease pharmacists or other experts), but also the team in the surgeon’s outpatient setting, where case managers can ensure adequate education, training, and cross-setting communication to balance the equation of infection prevention and management with antibiotic stewardship.

A recent manuscript published in *Frontiers in Medicine* “It’s about the patients: practical antibiotic stewardship in outpatient settings in the United States” by Alpesh Amin, et al. [7] contains recommendations for healthcare teams to support antibiotic stewardship principals for acute (bacterial) skin and soft tissue infections (ABSSSI) – including surgical site infections – as well as healthcare community acquired (bacterial) pneumonia (CAP).

Antibiotic resistance can result from the unnecessary prescribing for non-bacterial conditions including viral infections and [8,9] approximately 25–50% of antibiotic prescriptions for bacterial infections do not align with current guidelines [10–13] or may fail to consider local resistance patterns. This can result in the prescribing of antibiotics for longer durations (≥ 10 days) than recommended [11,14,15], with associated risk of *Clostridioides difficile*-associated diarrhea and drug toxicity [16–18].

The antibiotic stewardship or “smart prescribing” approach dictates that clinicians should follow the “4 Ds”: prescribe antibiotics only for treatment of bacterial infectious Diseases, while factoring in the appropriate Drug, Dose, and treatment Duration [7]. While hospital-based stewardship programs have demonstrated healthcare benefit, the expansion to the outpatient setting is more challenging.

What are the challenges of implementing antibiotic stewardship in the outpatient setting?

- The average healthcare provider may not have access to current antibiotic resistant patterns, health system-based education, interventions, and staff to guide appropriate prescribing practices
- Guidelines published by National health agencies (CDC) and professional organizations may be complex, not up-to-date, and lack recommendations for therapy duration, antibiotic choice, or how to interpret local resistance patterns
- Defensive prescribing of antibiotics out of concern for missing bacterial infections and possible medicolegal ramifications may cause pause in implementation further contributing to over-prescribing [19]
- Almost half of surveyed providers said they would need help to implement antibiotic stewardship practices [20]. Recognizing this need we offer a best practice guide for providers to make smart prescribing easier

What are the general recommendations for treatment of surgical site infections?

Use smart prescribing or the 4D approach to choose treatment to control bacterial infectious Diseases, using the appropriate Drug, Dose, and Duration:

Bacterial infectious diseases of interest to surgical teams include:

- Cellulitis, abscesses, wound infections, pyomyositis, necrotizing soft-tissue infections

Choice of treatment:

- Incision and drainage encouraged when indicated, followed by culture
- Choose antibiotic based on local resistance patterns, known/suspected pathogen or national resistance rates
- Common: cephalosporins (not for MRSA), trimethoprim/sulfonamides, glycopeptides, oxazolidinones, tetracyclines

Duration of treatment:

Superficial abscesses and surgical site infections can often be treated with I&D alone without antibiotics if minimal erythema and systemic inflammatory response (1)

Discontinue prophylactic antibiotics at the end of routine general surgery procedures [21–23]

Initial brief courses of antibiotics duration (5–7 days) [14] has been shown to be efficacious for most surgical infections and is likely to cause fewer adverse reactions [17]

How do I make smart prescribing easier?

Simplify guidance documents. Providers need easy to use guidance from experts that reflects daily real-world scenarios encountered [24].

Know local resistance patterns. Local health departments, community hospitals [25], a local infectious disease specialist, and routine culture laboratories are useful resources.

Patient/parent/care-giver education. When prescribing an antibiotic for prophylactic or post-surgical care, surgeons should stress the importance of adherence to dosing instructions, and why a specific antibiotic has been prescribed [26,27]. Patient discussions

should include post-surgical recovery course, treatment, potential side effects, warning signs of complications, and follow up.

What is the take-home message?

Antibiotic stewardship should follow the “4 Ds”: prescribe for bacterial infectious **Diseases**, with appropriate **Drug, Dose, and Duration**. More input from public health agencies, regulatory bodies, payors, and multidisciplinary groups is needed.

For further reading, please see the manuscript, supported by an expert Roundtable, “It’s about the patients: practical antibiotic stewardship in outpatient setting in the United States,” by Amin et al. [7], published in *Frontiers in Medicine* (<https://www.frontiersin.org/articles/10.3389/fmed.2022.901980/full>).

References

- Antimicrobial Resistance Collaborators. Global burden of bacterial antimicrobial resistance in 2019: A systematic analysis. *Lancet*. 2022; 399: 629-655.
- Centers for Disease Control and Prevention. Antibiotic Resistance Threats in the United States, 2019. 2019. Available from: <https://www.cdc.gov/drugresistance/pdf/threats-report/2019-ar-threats-report-508.pdf> [Accessed September 14, 2021].
- Centers for Disease Control and Prevention. Outpatient Antibiotic Prescriptions — United States, 2019. Available from: <https://www.cdc.gov/antibiotic-use/pdfs/Annual-Report-2019-H.pdf> [Accessed September 14, 2021].
- Magill SS, O’Leary E, Janelle SJ, Thompson DL, Dumyati G, et al. Changes in Prevalence of Health Care-Associated Infections in U.S. Hospitals. *N Engl J Med*. 2018; 379: 1732-1744.
- Ban KA, Minei JP, Laronga C, Harbrecht BG, Jensen EH, et al. American College of Surgeons and Surgical Infection Society: Surgical Site Infection Guidelines, 2016 Update. *J Am Coll Surg*. 2017; 224: 59-74.
- Zimlichman E, Henderson D, Tamir O, Franz C, Song P, et al. Health care-associated infections: a meta-analysis of costs and financial impact on the US health care system. *JAMA Intern Med*. 2013; 173: 2039-2046.
- Amin AN, Dellinger EP, Harnett G, Kraft BD, LaPlante KL, et al. It’s about the patients: Practical antibiotic stewardship in outpatient settings in the United States. *Front Med (Lausanne)*. 2022; 9: 901980.
- Donnelly JP, Baddley JW, Wang HE. Antibiotic utilization for acute respiratory tract infections in U.S. emergency departments. *Antimicrob Agents Chemother*. 2014; 58: 1451-1457.
- Johnson MC, Hulgan T, Cooke RG, Kleinpell R, Roumie C, et al. Operationalising outpatient antimicrobial stewardship to reduce system-wide antibiotics for acute bronchitis. *BMJ Open Qual*. 2021; 10: e001275.
- Pew Charitable Trusts. Antibiotic Use in Outpatient Settings. 2016. Available from: <https://www.pewtrusts.org/-/media/assets/2016/05/antibioticuseinoutpatientsettings.pdf> [Accessed December 14, 2021].
- Hurley HJ, Knepper BC, Price CS, Mehler PS, Burman WJ, et al. Avoidable antibiotic exposure for uncomplicated skin and soft tissue infections in the ambulatory care setting. *Am J Med*. 2013; 126: 1099-1106.
- Shively NR, Buehrle DJ, Clancy CJ, Decker BK. Prevalence of Inappropriate Antibiotic Prescribing in Primary Care Clinics within a Veterans Affairs Health Care System. *Antimicrob Agents Chemother*. 2018; 62: e00337-18.
- Jenkins TC, Knepper BC, Moore SJ, O’Leary ST, Brooke Caldwell, et al. Antibiotic prescribing practices in a multicenter cohort of patients hospitalized for acute bacterial skin and skin structure infection. *Infect Control Hosp Epidemiol*. 2014; 35: 1241-1250.
- Lee RA, Centor RM, Humphrey LL, Jokela JA, Andrews R, et al. Appropriate Use of Short-Course Antibiotics in Common Infections: Best Practice Advice From the American College of Physicians. *Ann Intern Med*. 2021; 174: 822-827.
- Lowery JL, Alexander B, Nair R, Heintz BH, Livorsi DJ. Evaluation of antibiotic prescribing in emergency departments and urgent care centers across the Veterans’ Health Administration. *Infect Control Hosp Epidemiol*. 2021; 42: 694-701.
- Brown KA, Khanafer N, Daneman N, Fisman DN. Meta-analysis of antibiotics and the risk of community-associated *Clostridium difficile* infection. *Antimicrob Agents Chemother*. 2013; 57: 2326-2332.
- Mulligan P, Shah N, Acree M, Grant J, Ravichandran U, et al. Adherence to antibiotic stewardship program associated with shorter course of treatment and fewer adverse events. *Antimicrob Stewardship & Healthcare Epidemiology*. 2021; 1: s30.
- Slimings C, Riley TV. Antibiotics and healthcare facility-associated *Clostridioides difficile* infection: systematic review and meta-analysis 2020 update. *J Antimicrob Chemother*. 2021; 76: 1676-1688.
- Tebano G, Dyar OJ, Beovic B, Béraud G, Thilly N, et al. Defensive medicine among antibiotic stewards: the international ESCMID AntibioLegalMap survey. *J Antimicrob Chemother*. 2018; 73: 1989-1996.
- Pew Charitable Trusts. Survey of doctors reveals challenges, strategies for reducing inappropriate antibiotic use. 2020. Available from: <https://www.pewtrusts.org/en/research-and-analysis/articles/2020/08/06/survey-of-doctors-reveals-challenges-strategies-for-reducing-inappropriate-antibiotic-use> [Accessed September 14, 2021].
- Stevens DL, Bisno AL, Chambers HF, Dellinger EP, Goldstein EJ, et al. Executive summary: practice guidelines for the diagnosis and management of skin and soft tissue infections: 2014 update by the infectious diseases society of america. *Clin Infect Dis*. 2014; 59: 147-159.
- Charalambous CP, Tryfonidis M, Swindell R, Lipsett AP. When should old therapies be abandoned? A modern look at old studies on topical ampicillin. *J Infect*. 2003; 47: 203-209.
- Trial of short-course antimicrobial therapy for intraabdominal infection. *N Engl J Med*. 2018; 372: 1996-2005.
- Huizinga WK, Kritzing NA, Bhamjee A. The value of adjuvant systemic antibiotic therapy in localised wound infections among hospital patients: a comparative study. *J Infect*. 1986; 13: 11-16.
- Spellberg B, Wright WF, Shaneyfelt T, Centor RM. The Future of Medical Guidelines: Standardizing Clinical Care With the Humility of Uncertainty. *Ann Intern Med*. 2021; 174: 1740-1742.
- Humphries R, Mendez J, Miller LG, Miner A, Fernandes P, et al. The regional antibiogram is an important public health tool to improve empiric antibiotic selection, *Stenotrophomonas maltophilia* as a case example. *Open Forum Infect Dis*. 2017; 4: S258.
- Fleming-Dutra KE, Mangione-Smith R, Hicks LA. How to Prescribe Fewer Unnecessary Antibiotics: Talking Points That Work with Patients and Their Families. *Am Fam Physician*. 2016; 94: 200-202.

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