

Antibiotic Stewardship 101: An Intro for Emergency Physicians

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Background

The emergence of antibiotic resistant bacteria began in the 1940s after the widespread introduction of penicillin into clinical practice. Acceleration in the magnitude of the problem was noticed in the 1990s, with antibiotic resistance genes detected in most pathogenic bacterial species and the first identification of pan-resistant bacterial strains. Increasing commercial and clinical usage of newly developed broad-spectrum antibiotics was cited as the most significant factor driving this foreboding trend.¹ Today the threat from resistant bacteria looms larger than ever. On September 16, 2013, the CDC released its first comprehensive report on all antibiotic resistant bacteria that pose large-scale public health threats. This report highlights the burden of bacterial resistance, with 2 million patients infected annually in the United States alone and at least 23,000 deaths tied directly to infection with these organisms. This does not account for the many additional deaths in which drug resistant bacterial infections are contributing factors.²

Antibiotic Stewardship Defined

The public has entrusted the responsible use of antibiotics to health care providers. While antibiotics offer immense benefits for individual patients suffering from bacterial infections, if not applied judiciously they can also breed organisms that pose a threat to all of humanity. Practically speaking, antibiotic stewardship refers to any strategy that aims to optimize antibiotic usage (selection, dose, and duration). The ultimate goal of these efforts is to produce an optimal clinical response while reducing health care costs, mitigating adverse outcomes, and preventing the further development of resistant organisms.³

Stewardship not only refers to restricting antibiotic use but also to improving the timely delivery of broad-spectrum antibiotics when clinically indicated, such as in severe sepsis.⁴ The emergency department (ED) remains a relatively untouched frontier for antibiotic stewardship efforts, which has prompted a recent call for improved practices and new research initiatives.⁵ Successful integration of established antibiotic stewardship programs in the unique ED setting could yield

substantial benefits, including reduced antibiotic utilization, medication costs, medication errors, adverse drug reactions, and antibiotic-associated infections such as *Clostridium difficile*.^{2,6,7}

CDC Partners with AAEM

In 1995, the Centers for Disease Control and Prevention (CDC) launched the National Campaign for Appropriate Antibiotic Use in the Community. This national initiative, renamed in 2003 as *Get Smart: Know When Antibiotics Work*, involves media campaigns, development of guidelines and educational materials, and support for local appropriate antibiotic use programs. The program utilizes a three-part strategy⁸ to stem the tide of antibiotic resistance:

- Promoting adherence to appropriate prescribing guidelines among providers.
- Decreasing demand for antibiotics for viral upper respiratory infections among healthy adults and parents of young children.
- Increasing adherence to prescribed antibiotics for upper respiratory infections.

The first *Get Smart about Antibiotics Week*, a promotional effort to raise awareness about antibiotic resistance and stewardship, was held in 2008. Each year the CDC selects a different group of health care providers as a target for spreading the word about antibiotic stewardship. For 2013, the CDC decided to focus on emergency care providers, acknowledging the ED as an increasingly important setting for antibiotic usage. The ED straddles the inpatient and outpatient settings and the decisions we make with regard to antibiotics have massive downstream implications.⁵ In order to reach its target audience, the CDC partnered with the American Academy of Emergency Medicine (AAEM) to promote Get Smart about Antibiotics Week 2013, which took place November 18-24. During this week AAEM posted this article and links to the CDC's Get Smart activities on its web page, in addition to spreading the word by social media.

Top 10 Ways to Improve Stewardship in Your ED

We have compiled a list of ten ways to enhance antibiotic stewardship in your ED.

10. **Post-prescription culture review.** Ensuring that antibiotic coverage is sufficient limits adverse outcomes related to treatment failure, while narrowing coverage based on culture results should enhance stewardship and reduce adverse medication reactions. Given the time-intensive nature of such a program, we recommend utilizing non-physician staff for all aspects except antibiotic selection decisions. An ED pharmacist can play an important role in this process.

9. **Antibiotic order sets and clinical decision support systems.** Institutions have successfully implemented strategies using written forms⁹ and, in some cases, computerized physician order entry to streamline the selection of empirical antibiotics in the ED. While more research is needed, order sets can potentially reduce unnecessary antibiotic usage by limiting physician choices to evidence-based treatment guidelines coupled with local trends in antibiotic resistance. Ideally, such systems should be tailored to the patient based on data obtained during the evaluation (e.g., risk factors, comorbidities, drug allergies, and any available laboratory and microbiology results).

8. **A multidisciplinary, antibiotic usage, quality improvement process.** Pharmacists and infection disease specialists can provide invaluable feedback and guidance on the optimal use and appropriate dosing of antibiotics in the ED. They also play an integral part in many hospital-based

antibiotic stewardship programs¹⁰ and should be consulted as key players in ED-based initiatives to improve antibiotic prescribing and reduce unnecessary antibiotic utilization.

7. An Antibiotic Stewardship Champion. Emergency care providers often face immense pressure to prescribe antibiotics outside of clinical guidelines. This comes from patient requests and fear of patient complaints/low satisfaction scores, which can threaten both compensation and job security.¹¹⁻¹³ Delegating a member of the group to serve as ED Antibiotic Stewardship Champion establishes this as something of value to the group. This individual could coordinate continuing education on antibiotic resistance/stewardship topics and serve as the lead contact with administration regarding disputes over decisions to appropriately withhold antibiotics. The presence of a formalized leadership role may empower individual clinicians to utilize evidence-based guidelines rather than prescribe under pressure.

6. Determine local antimicrobial susceptibilities. Hospital antibiograms provide a snapshot of the antimicrobial susceptibilities of common microorganisms isolated by the microbiology laboratory of your facility. They are most useful to emergency care providers when broken down by inpatient versus outpatient cultures, and are typically updated annually. In some cases antibiograms specific to your ED may be available. Antibiograms allow emergency providers to make informed choices about empiric antibiotic therapy based on local antibiotic resistance patterns, thereby increasing the likelihood of success in treating an infection. Limitations of antibiograms, however, include a bias towards more severe infections, which may not represent antimicrobial susceptibility in the general ED population.

5. Consider cultures when initiating antibiotic therapy. While the results of cultures obtained from blood, urine, and other potential sites of infection are unlikely to come back in the course of an ED stay and rarely change therapy, they occasionally play an important part in confirming infection and assuring that the causative microorganism is susceptible to the empiric antibiotic regimen initiated in the ED. Based on these susceptibilities the antibiotic spectrum can be narrowed, minimizing the over-utilization of antibiotics and antibiotic-associated adverse events and complications.

4. Administer broad-spectrum antibiotics to patients with septic shock early. The most recent update of the *Surviving Sepsis Campaign* guidelines continues to recommend empiric antibiotic therapy targeting all likely pathogens based on the patient's clinical history within one hour of the recognition of septic shock and severe sepsis without septic shock.⁴ Both inappropriate and delayed antibiotic therapy have been linked to significantly increased mortality in septic shock.^{14,15} In most cases, empiric coverage of Gram-positive and Gram-negative bacteria, including resistant organisms such as methicillin-resistant *Staphylococcus aureus*, is warranted. In immunocompromised patients, antifungal therapy against *Candida* species should also be considered. Restriction of initial antibiotics in critically-ill patients is inappropriate and should only be addressed once the patient's clinical status has improved and additional microbiological data is available to guide de-escalation of therapy.

3. Avoid antibiotics for uncomplicated abscesses. Several studies conducted in the ED provide data to support withholding antibiotics after incision and drainage of uncomplicated abscesses, even in cases of suspected methicillin-resistant *Staphylococcus aureus*.¹⁶ However, it is important to understand the clinical scenarios in which the CDC¹⁷ and Infectious Disease Society of

America¹⁸ recommend antibiotics in the treatment of acute skin and soft tissue infections, such as patients with comorbidities, and the recommendation to send a wound culture for patients receiving antibiotics.

2. **The modified Centor score.** Sore throat is a common complaint among ED patients. Although concerns about Group A Streptococcal pharyngitis and resultant suppurative complications drive evaluation and treatment, the majority of cases are caused by viruses. Derived in the ED setting over 30 years ago, the Centor Score (range 0-4) aims to utilize clinical criteria to risk stratify patients and ultimately help differentiate bacterial from viral cases of pharyngitis. One point is assigned for each of the following criteria: fever, absence of cough, tonsillar exudates, and swollen/tender anterior cervical nodes.¹⁹ The Mclsaac score modifies the original Centor criteria by adding one point for patients aged 3 to 14 years and subtracting one point from those over 45 years old. Current guidelines recommend no rapid testing and withholding antibiotics in patients with scores of zero and one, and treating only positive rapid test results for scores of two or greater. In addition to being supported by the CDC,²⁰ the utility of these scoring systems when used in combination of with rapid testing has been validated in large cohorts and with meta-analysis.^{21, 22}

1. **Withhold antibiotics for uncomplicated respiratory tract infections.** Reducing the widespread, inappropriate use of antimicrobial agents for uncomplicated upper and lower respiratory tract infections, the majority of which are viral, is a core principle of the CDC's *Get Smart: Know When Antibiotics Work* program. Using a national data set, researchers identified respiratory conditions as responsible for over 40% of all antibiotic use in outpatient settings. The majority of these prescriptions were for broad spectrum antibiotics, a trend that was increased among ED patients.²³ On a positive note, educating patients about the nature of their illness rather than giving antibiotics for upper respiratory infection may lead to greater patient satisfaction.²⁴ As part of the *Get Smart* program, the CDC has developed a viral illness prescription pad as a novel patient education tool. It contains information about why antibiotics are not indicated and 'prescribes' supportive care.²⁵

Antibiotic resistance represents an increasing threat to public health and makes treating patients with infectious diseases more difficult. Although much work remains to be done in identifying optimal approaches to antibiotic stewardship in the ED, it is our hope that everyone will strive to implement the highlighted strategies. AAEM is proud to partner with the CDC for *Get Smart About Antibiotics Week 2013*, and looks forward to future collaboration on efforts specifically designed to improve antibiotic stewardship in the ED.

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