

Patient Safety Tip of the Week

March 30, 2021

Need for Better Antibiotic Stewardship

Inappropriate use of antimicrobials remains problematic from a number of perspectives. It gives rise to bacterial antibiotic resistance, allergies, complications like diarrhea and *C. difficile* infections, and it can be expensive.

Two recent publications highlight the need for better antimicrobial stewardship. On the inpatient side, Magill et al. ([Magill 2021](#)) used data from 192 US hospitals participating in the CDC’s Emerging Infections Program (EIP) surveillance network to evaluate the appropriateness of antimicrobial use for hospitalized patients treated for community-acquired pneumonia (CAP) or urinary tract infection (UTI) present at admission or for patients who had received fluoroquinolone or intravenous vancomycin treatment. Overall, treatment was unsupported for 55.9% of patients, including 27.3% who received vancomycin, 46.6% who received fluoroquinolones, 76.8% with a diagnosis of UTI, and 79.5% with a diagnosis of CAP. Common reasons for unsupported use included long duration, antimicrobial selection that deviated from guidelines, absence of documented signs or symptoms of infection, and lack of microbiologic evidence of infection.

A report by the Pew Charitable Trusts ([Pew 2021](#)) used the same data and an expert panel set to national targets to improve prescribing.

For community-acquired pneumonia (CAP) the expert panel concluded that medically justifiable exceptions to the treatment guidelines occur in about 10% of all CAP cases (eg. when a patient has a particularly severe CAP infection or may need additional antibiotic therapies because of secondary complications). The experts therefore determined that 90% of the inappropriate use should be eliminated. They also recommended there be focus on ensuring the appropriate duration of treatment.

Similarly, for urinary tract infections, the experts estimated that in about 10% of UTI cases, circumstances such as secondary complications or severe infections may allow for exceptions to the treatment recommendations. The panel therefore recommended a national target to reduce inappropriate UTI prescribing by 90%.

For fluoroquinolone use, the expert panel set a target of a 95% reduction in this use, which allows room for rare exception events. They recommend that, given the high risks of toxicity and adverse events associated with fluoroquinolone use, alternative and

equally effective antibiotic agents should always be favored over fluoroquinolones when available.

Vancomycin should be used only when necessary, and treatment guidelines recommend close monitoring of dosing to avoid dangerous side effects. The expert panel set a target of a 95% reduction in unsupported use of vancomycin.

The Pew report notes that these recommendations should be applied to the adult population and did not make recommendations for the pediatric population.

The report goes on to describe antibiotic stewardship programs, noting that there is no “one-size-fits-all” approach to antibiotic stewardship. Hospitals vary in terms of size, patient population, needs, and resources. To address these differences, the CDC created two guides, “[The Core Elements of Hospital Antibiotic Stewardship Programs](#)” and “[Implementation of Antibiotic Stewardship Core Elements at Small and Critical Access Hospitals](#)” that describe a wide variety of interventions that hospitals can tailor to meet their own needs.

Things aren’t any better on the outpatient side either. A study of outpatient antibiotic prescribing using data from a US commercial insurance database found that 23.2% of prescriptions were inappropriate, 35.5% were potentially appropriate, and 28.5% were not associated with a recent diagnosis code ([Chua 2019](#)). Approximately 1 in 7 enrollees filled at least one inappropriate antibiotic prescription in 2016.

And another study in a Medicaid population ([Fischer 2020](#)) showed that large fractions of antibiotic prescriptions are filled without evidence of infection-related diagnoses or accompanying clinician visits. The authors found 55 percent of antibiotic prescriptions were for clinician visits with an infection-related diagnosis, but 17 percent were for clinician visits without an infection-related diagnosis, and 28 percent were not associated with a visit. The authors suggest that current ambulatory antibiotic stewardship policies miss about half of antibiotic prescribing.

Another study ([Tribble 2020](#)) looked at inappropriate antibiotic prescribing in children’s hospitals. The researchers found that 35.0% of children had ≥ 1 active antibiotic order. Among those receiving antibiotics for infectious use, 25.9% were prescribed ≥ 1 suboptimal antibiotic, and 21.0% of antibiotic orders prescribed for infectious use were considered suboptimal. Most common reasons for inappropriate use were bug–drug mismatch (27.7%), surgical prophylaxis > 24 hours (17.7%), overly broad empiric therapy (11.2%), and unnecessary treatment (11.0%). The majority of recommended modifications were to stop (44.7%) or narrow (19.7%) the drug. Of significance is that 46.1% of suboptimal use was not captured by current antibiotic stewardship practices.

One group of patients receiving inappropriate antibiotics in an ambulatory setting are older adults ([Pulia 2020](#)). Pulia et al. identified multiple factors contributing to inappropriate antibiotic use in this setting. One theme was diagnostic uncertainty and associated concern for potential deterioration resulting in hospital admission or death,

especially the concern for progression of UTI's or other bacterial infections to sepsis. These concerns often led to a lower threshold to initiate antibiotics without a clear indication, preferential use of broad-spectrum agents, longer treatment courses, and more frequent hospital referrals for initiation of intravenous antibiotics. Other contributing factors included time pressures and patient demands.

Pulia et al. note that studies in ambulatory care settings have found that the following interventions show promise in improving antibiotic stewardship:

- clinician education (active, in person)
- public displays of antibiotic stewardship support
- clinical decision support including best practice alerts in the electronic health record
- audit and feedback
- communication skills training
- requiring clinicians to justify in the medical chart why they are prescribing an antibiotic
- delayed prescribing
- point-of-care diagnostics
- academic detailing

The article goes on to discuss antibiotic prescribing in other venues, such as the emergency department, urgent and retail care clinics, and telemedicine visits.

Another factor influencing inappropriate antibiotic prescribing is patients' prior care experiences. Shi et al. ([Shi 2020](#)) used data from a national US insurer to identify patients <65 years old with an index acute respiratory illness (ARI) during an urgent care center visit. They were able to determine provider prescribing rates as well. In the year after the index ARI visit, patients seen by the highest-prescribing clinicians received more ARI antibiotics compared to those seen by the lowest-prescribing clinicians. Interestingly, the increase in antibiotics was also observed among the patients' spouses.

And we often forget about dental practices. Dentists actually prescribe about 10% of all outpatient antibiotics and unnecessary dental prophylaxis may be associated with serious adverse effects ([Gross 2019](#), [Suda 2019](#)). Up to 80% of antibiotics prescribed prophylactically prior to dental procedures may be unnecessary. Gross et al. found that, even though antibiotic prophylaxis is prescribed for a short duration (≤ 2 days), it is not without risk. They found that 3.8% of unnecessary prescriptions were associated with an antibiotic-related adverse event. And, since most antibiotic-related adverse events are diagnosed in medical settings, dentists may not be aware of these adverse effects.

Hopefully, you've upgraded your antimicrobial stewardship programs in keeping with last year's CMS mandate.

Incorporating "the 4 moments of antibiotic decision making" into clinical practice is recommended as a way to reduce inappropriate antibiotic prescribing ([Tamma 2019](#)). The 4 "moments" are:

1. “Does this patient have an infection that requires antibiotics?”
2. “Have I ordered appropriate cultures before starting antibiotics? What empirical antibiotic therapy should I initiate?”
3. “A day or more has passed. Can I stop antibiotics? Can I narrow therapy? Can I change from intravenous to oral therapy?”
4. “What duration of antibiotic therapy is needed for this patient’s diagnosis?”

Note that an Australian hospital adopted a stewardship program based on the “5 Moments of Antimicrobial Prescribing” ([Ghizzone 2019](#)). The “5 Moments” included:

- Escalation
- De-escalation
- Discontinuation
- Switch
- Optimization

The CDC does acknowledge that some progress has been made in antibiotic stewardship. A CDC report found that the number of hospitals that reported having an antibiotic stewardship program meeting all seven of CDC’s Core Elements of Hospital Antibiotic Stewardship Programs almost doubled from 2014 to 2017 ([CDC 2019](#)). (The seven core elements are leadership commitment, accountability, drug expertise, action, tracking, reporting and education.) Of the 4,992 acute care hospitals responding to the 2017 National Healthcare Safety Network (NHSN) Annual Hospital Survey, 3,816 (76.4%) reported uptake of all seven Core Elements. They attributed this increase to a number of factors, including new accreditation requirements for hospitals.

But the report also identified the following opportunities to improve antibiotic prescribing:

- Antibiotics are often unnecessarily prescribed for common respiratory conditions in outpatient settings
- Fluoroquinolones are unnecessarily prescribed for urinary tract infections and respiratory conditions
- Nearly 70% of antibiotic courses for sinus infections were longer than recommended
- Improvement is needed in antibiotic selection in children
- Antibiotic duration is too long in adult hospitalized patients with community-acquired pneumonia

The CDC report has links to many useful resources for antibiotic stewardship.

The Pulia article mentioned above ([Pulia 2020](#)) noted that clinical decision support was sometimes of help as an antibiotic stewardship tool. Another study from the UK ([Gulliford 2019](#)) evaluated an antimicrobial stewardship intervention comprised a brief training webinar, automated monthly feedback reports of antibiotic prescribing, and electronic decision support tools to inform appropriate prescribing. Compared to usual care, electronically delivered interventions, integrated into practice workflow, resulted in moderate reductions of antibiotic prescribing for respiratory tract infections in adults.

There was no evidence of effect for children younger than 15 or people aged 85 years and older. Importantly, there was no evidence of an increase in serious bacterial complications.

Goss et al. ([Goss 2020](#)) evaluated an indication-based clinical decision support tool to improve antibiotic prescribing in the emergency department for skin and soft tissue infections, respiratory infections, and urinary infections. For those conditions, selection rate of a guideline-approved antibiotic for a given indication improved from 67.1% to 72.2%. When duration of therapy is included as a criterion, selection of a guideline-approved antibiotic was lower and improved from 24.7% to 31.4%, highlighting that duration of therapy is often missing at the time of prescribing. The most substantial improvements were seen for pneumonia and pyelonephritis with an increase from 87.9% to 97.5% and 62.8% to 82.6%, respectively. They conclude that antibiotic prescribing can be improved both at the drug and duration of therapy level using a non-interruptive and indication based-clinical decision support approach. They note that incorporation of duration of therapy guidelines into the antibiotic prescribing process is needed.

All these studies show that we still have lots of opportunities to improve our antimicrobial stewardship programs. CDC's two guides, "[The Core Elements of Hospital Antibiotic Stewardship Programs](#)" and "[Implementation of Antibiotic Stewardship Core Elements at Small and Critical Access Hospitals](#)" are great resources to help you improve your antimicrobial stewardship programs. The 2019 CDC report ([CDC 2019](#)) also has links to some good resources.

Some of our prior columns on antibiotic stewardship:

- October 14, 2014 "[Antibiotic Stewardship](#)"
- November 2015 "[Medications Most Likely to Harm the Elderly Are...](#)"
- July 2016 "[NQF/CDC Guideline on Antibiotic Stewardship](#)"
- August 2016 "[Some Reassurance on Antibiotic Stewardship](#)"
- November 2016 "[C. Diff and Your Predecessor's Room](#)"
- December 2016 "[Update on Ambulatory Antibiotic Stewardship](#)"
- July 2017 "[Antibiotics and Adverse Events](#)"
- July 2019 "[Dental Prescribing Called Into Question](#)"
- July 21, 2020 "[Is This Patient Allergic to Penicillin?](#)"

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