

## Determination of Antimicrobial Prescribing Practices in an Integrated Health System Emergency Department

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### ABSTRACT

**Introduction.** Antibiotic stewardship utilizes interprofessional collaborative practices, including professionals from medicine, pharmacy, nursing, social services, and clinical laboratory science, to identify potential problems proactively. A tertiary care integrated health system's Emergency Department (ED) aimed to identify antimicrobials prescribed to the outpatient community as part of a proactive antimicrobial stewardship project.

**Methods.** A pilot, prospective, snapshot of a tertiary community hospital's outpatient antimicrobial prescribing habits was conducted. All subjects were identified via a daily report of patients discharged from the ED over 30 days in the summer of 2017 and individually reviewed for prescribed antimicrobial(s). Exclusions were hospital admission, antimicrobial sensitivity, and antimicrobial courses less than five days or more than 14 days. The primary goal was determining the number of antimicrobial oral tablets/capsule prescriptions to adult outpatients within a 5 to 14-day treatment window. Secondary goals were to include the diagnosis, non-capsule/tablet antimicrobial, pediatric patients, and prescriptions outside the treatment window.

**Results.** Total number of antimicrobial prescriptions over the 30-day period was 653 in 5,520 individual visits. Total number of adults prescribed oral antimicrobials was 467 (15.6 daily). Patients were diagnosed with infections including urinary tract, cellulitis, soft tissue injury, abscess, upper respiratory, dental caries, gastrointestinal, sexually transmitted, otitis media/externa, pneumonia, viral, pyelonephritis, tick-borne, fungal, Bell's Palsy, and sepsis. The number of non-adult, non-oral, and outside window treatment antimicrobial prescriptions were 186 (6.2 daily). With an average 184 patients treated in the ED daily, approximately 11.8% received antimicrobial treatment on discharge.

**Conclusion.** Important aspects of the project were the evaluation of antimicrobial prescribing habits for a midwest ED and identification of potential complications requiring future interventions for follow-up or preventative measures to assist in patient care and community health. Areas of practice improvement were identified inadvertently as a result of this project. Potential future studies included seasonal variability, whether the patient obtained a prescription and complied with treatment, and differences between inpatient and outpatient antimicrobial prescribing practices.

### INTRODUCTION

Healthcare improvement is constant.<sup>1</sup> Communication gaps can exist between institutions and the communities served.<sup>2</sup> Antibiotic stewardship plays a key role in minimizing antibiotic usage and preventing resistance in hospitals and clinics by systematically reviewing patients' data.<sup>3</sup> Antibiotic stewardship utilizes interprofessional collaborative practices including professionals from medicine, pharmacy, nursing, social services, and clinical laboratory sciences.<sup>4,5</sup> A tertiary care integrated health system's Emergency Department (ED) in conjunction with the antimicrobial stewardship aimed to identify antimicrobials prescribed to the outpatient community as part of a proactive project.

This research project started on Friday evening with an emergency medicine (EM) physician asking a simple question: "How many antimicrobial prescriptions are sent [from this ED] into the community on a daily basis?" The computer system was unable to tabulate these data automatically nor were they available through information technology. An online query yielded no tangible answers. Direct communication with the U.S. Centers for Disease Control and Prevention revealed that the number of antimicrobial prescriptions originating from an ED was unknown.

This project provided a prospective snapshot of a tertiary community hospital's antimicrobial prescribing habits and identified potential concerns to improve patient safety that could be applicable to other institutions. Although the option to perform the study in the local pharmacies was entertained, it was dismissed due to the lack of time and potential for prescriptions imported and exported to and from outlying communities.

### METHODS

This project was approved as a quality improvement project by the pharmacy and emergency departments on behalf of the hospital system's antibiotic stewardship committee. As the project was not designated to affect patient care, this study did not require the health system's institutional review board.

All patients were identified via a daily report if discharged from the ED over the 30-day period that was studied in the summer of 2017 and individually reviewed for prescribed antimicrobials. The electronic medical record was used to run a report that identified all patients admitted to the emergency department but not admitted to the hospital. This report was utilized to screen for patients that had been prescribed antimicrobial therapies during the study. When identified, the data for the project were extracted from the patient's chart without any patient identifiers. Exclusions were hospital admission, antimicrobial sensitivity, and antimicrobial courses less than five days or more than 14 days. The primary goal was determining the number of antimicrobial oral tablets/capsule prescriptions to adult outpatients (18 years or older) with a 5 to 14-day treatment window. The treatment length was chosen due to an ED prescriber survey before the start of the study and based upon the antibiotic stewardship committee's recommendation. Secondary goals were to include the diagnosis, non-capsule/tablet antimicrobial, pediatric, and prescriptions outside the treatment window.

‘Courses of antimicrobial therapy’ and ‘number of antimicrobials’ referred to different prescriptions; each one representing a new antimicrobial therapy. Prescribed is defined as a physician, nurse practitioner, or physician assistant authorized a written or electronic prescription to the patient or their pharmacy to be dispensed. ‘Dispensed’ or ‘doses of antibiotic therapy’ referred to the number of tablets or capsules provided by the pharmacy to the patient. Sensitivity described any intolerance, hypersensitive reaction, or allergy that would prevent a patient from completing a course of antimicrobial therapy or transition to another one for treatment.

**RESULTS**

Prescriptions for 653 antimicrobials were identified over the 30-day study period. Adults were prescribed 467 different oral tablet/capsule antimicrobials over the 30 days for an average of 15.6 prescriptions daily. Patients were diagnosed with infections including urinary tract (UTI), cellulitis, soft tissue injury, abscess, upper respiratory, dental caries, gastrointestinal, sexually transmitted, otitis media/externa, pneumonia, viral, pyelonephritis, tick-borne, fungal, Bell’s Palsy, and sepsis (Figure 1). Viral illnesses included: exposure to blood-borne pathogens, herpes simplex and zoster. The number of non-adult, non-tablet/capsule and outside window treatment antimicrobial prescriptions were 186 over 30 days or an average of 6.2 prescriptions daily (Figure 2). Cephalosporin, amoxicillin, and trimethoprim-sulfamethoxazole were the most prescribed (52.5%; Figure 3).

This study evaluated 5 to 14 days of therapy to identify infectious diseases being treated and ensure that no patient was prescribed greater than 14 days of therapy. Although no patient was prescribed more than 14 days, 20 were prescribed less than five days. When evaluating the information, seven were treated for fungal infections and the remaining 13 were treated for bacterial infections, including traveler’s diarrhea, urinary tract infection, and pneumonia.

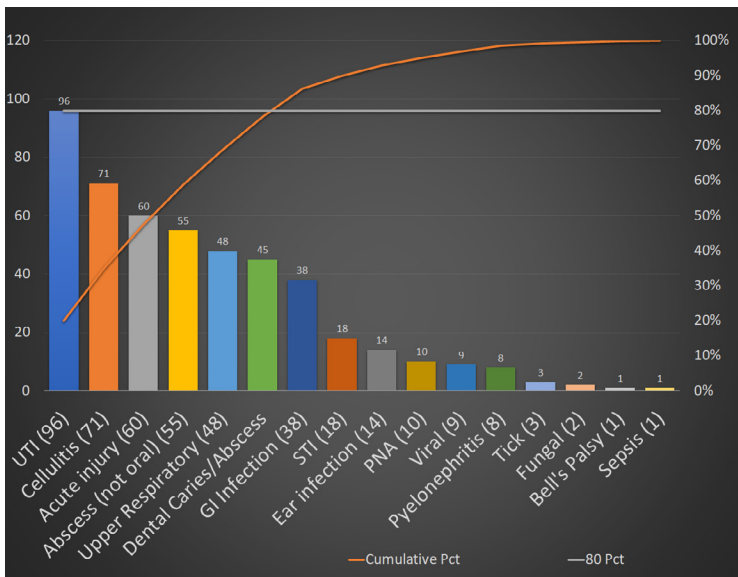


Figure 1. Emergency department antimicrobial outpatient prescriptions. \*  
 \*PNA = pneumonia; GI = gastrointestinal; STI = sexually transmitted infection; UTI = urinary tract infection.

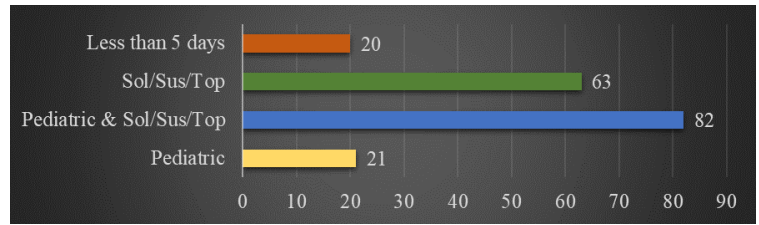


Figure 2. Other antimicrobial outpatient prescriptions.\*  
 \*Sol = solution; Sus = suspension; Top = topical

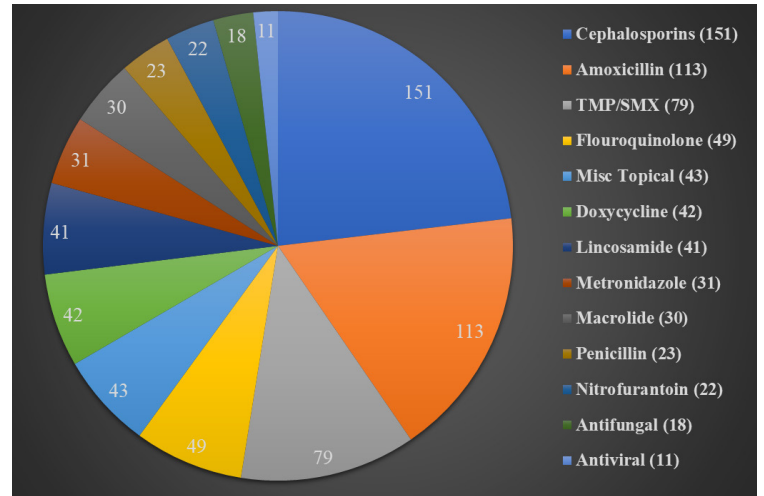


Figure 3. Types of outpatient antimicrobials prescribed.

**DISCUSSION**

With 67,000 patients annually, or an average of 184 patients daily treated in the ED, approximately 11.8% received an antimicrobial treatment on discharge. These antimicrobials treated 16 different forms of infection. UTIs, cellulitis, acute injury, non-oral abscess, and upper respiratory infections comprised most of the adult oral tablet/capsule antimicrobial prescriptions. Of the non-adult prescriptions, pediatric patients required oral solution, suspension, and topical treatment at increased frequency, which is associated with pediatric patients’ inability to tolerate oral tablets/capsules.

Interestingly, a patient was discharged from the ED with an oral antibiotic for the diagnosis of sepsis with insufficient source documentation. It is uncertain whether this patient had the correct diagnosis charted, chose to decline hospitalization, or was anticipating hospice care. Another unique finding was a prescription for levofloxacin 750 mg tablets with the instruction to take one tablet by mouth daily and dispense #750 tablets. This prescription was accepted by insurance, filled by a retail pharmacy, and declined by the patient that could not afford the price of the medication. However, this fact was identified during the study review and a new prescription called into the pharmacy with the patient being notified of the new price. Although the study was not designed to evaluate for correct antimicrobial prescribing practices, it inadvertently discovered potential concerns that warranted additional evaluation of the process. As seen in the literature, approximately 30% of all

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outpatient antimicrobials are prescribed inappropriately and rates as high as 39% have been documented from emergency departments.<sup>6</sup>

This project was unique in that it was a prospective evaluation. No other known research project quantified the number of antimicrobial prescriptions from a midwestern ED. In comparison to the Iowa City Veterans Affairs (VA) Health Care System's ambulatory care center, the top three antimicrobials prescribed were macrolide, amoxicillin, and fluoroquinolone (totaling 49.9%).<sup>7</sup> Our community tertiary hospital's ED revealed that cephalosporin, amoxicillin, and trimethoprim-sulfamethoxazole were the most prescribed (52.5%). The most common diagnoses were slightly different in Iowa's VA. The VA's ambulatory center top three indications were skin and soft-tissue infections (SSTI), acute respiratory tract infections, and UTIs; whereas in this study, they were identified as SSTI, UTI, and acute injuries treated with empiric antibiotics due to wound contamination. Two key differences between these indications and antimicrobial selection were the different populations served and the lack of an antibiogram to compare resistance patterns. Through our institution's use of more narrow-spectrum antibiotics, it is possible that resistance patterns for the broad-spectrum agents would be preserved for more severe infections and septic patients.

Limitations to this study included seasonal and geographic variability, correct documentation, if patients were being discharged to home, a skilled nursing facility, or hospice. Potential future studies include whether the patient obtained the prescription and complied with treatment, and the utility of someone evaluating prescriptions leaving the emergency department to ensure accuracy, different seasons and geographic locations, and ratio of inpatient to outpatient prescriptions written.

This project's most important aspects were the evaluation of antimicrobial prescribing habits for a midwest ED and identification of potential complications for future evaluation and prevention to promote patient care and community health.

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