


## Concise Communication

# Antibiotic assessment at hospital discharge—Room for stewardship intervention

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### Abstract

Our stewardship team evaluated 19 months of discharge antibiotic prescriptions to determine prescribing appropriateness and to characterize the interventions made. Intervention occurred in 9.7% of patients, with a 58% acceptance rate. Most interventions were educational (antibiotic course was complete at time of intervention). Discharge antibiotic review is a potential stewardship tool.

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Inpatient antimicrobial stewardship teams (ASTs) have been widely implemented to guide appropriate antibiotic prescribing and have proven effective in promoting successful patient outcomes, limiting the spread of antimicrobial resistance in hospital settings, and improving healthcare cost-effectiveness.<sup>1,2</sup> However, most antibiotic consumption occurs in outpatient settings. In 2015, 269 million antibiotic courses were prescribed in US outpatient settings. An estimated 30% of these prescriptions were unnecessary, had an inappropriate duration of therapy, inappropriate dosing, or inadequate spectrum of coverage.<sup>3</sup>

Outpatient antibiotic prescriptions linked to a recent hospitalization may be an area in need of improvement.<sup>4,5</sup> Retrospective cohort studies examining antibiotic prescribing at hospital discharge found 53%–70% of prescriptions inappropriate.<sup>6,7</sup> Studies of stewardship interventions targeting antibiotic prescriptions during transition of care from the inpatient to outpatient setting are limited.<sup>8</sup> In this study, we evaluated 19 months of discharge antibiotic prescriptions to determine appropriateness of prescribing and characterize interventions made by an AST.

### Methods

During the study period (June 2017–December 2018), pharmacy technicians began twice weekly retrospective review of pharmacist discharge medication reconciliation notes to identify patients discharged on oral antibiotics. Patients were excluded from AST review if followed by the infectious disease (ID) consult service. One or more AST members (ID physician, ID fellow, and ID

pharmacist) at an 87-bed Midwest Veterans' Affairs Hospital, averaging 496 discharges per month, reviewed the electronic health records (EHRs) of patients discharged from the hospital on oral antibiotics for appropriateness of antibiotic drug choice, dosing, and duration. Appropriateness was based on local guidelines and decision support tools, national guidelines, and the expertise of the reviewer. Due to limited resources, reviews occurred twice weekly and included patients discharged in the previous 3 or 4 days. Each patient was collaboratively reviewed by all AST members present during rounds. If it was determined that the prescribed antibiotic regimen could have been optimized, a verbal and/or written recommendation was made to the prescribing service and, in some cases, the pharmacist. All recommendations were documented in the EHR with cosignature of the note by lead AST members. When additional information was needed for clinical decision making, antibiotic choices were discussed with providers before appropriateness was determined. Interventions often focused on education of the prescribing inpatient provider, although providers who assumed care after discharge were often included. Intervention type included (but was not limited to) antibiotic discontinuation, change of antibiotic, dose, or duration, and recommended diagnostic testing. AST team members spent ~3 hours weekly engaged in discharge rounds.

Interventions were logged in a database, and prescribing team or provider, antibiotic, indication, and type of intervention was collected. Recommendation acceptance was determined retrospectively through chart review. This study was deemed to represent quality improvement rather than research-related activities by the University of Wisconsin Health Sciences Institutional Review Board Quality Improvement Program Evaluation Self-Certification Tool.

### Results

We identified 929 patients discharged on oral antibiotics between June 2017 and December 2018. The AST suggested changes in

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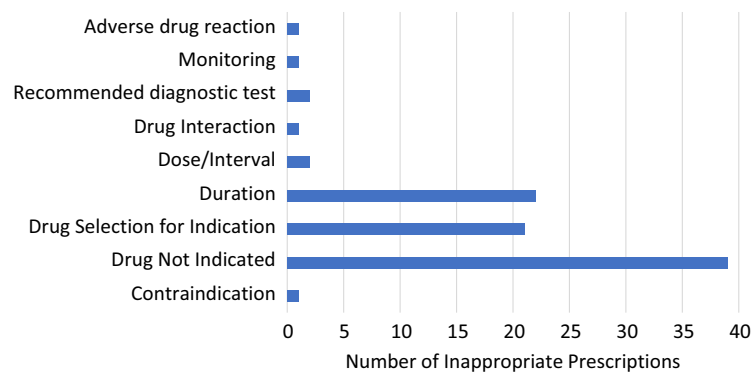


Fig. 1. Reason for Intervention.

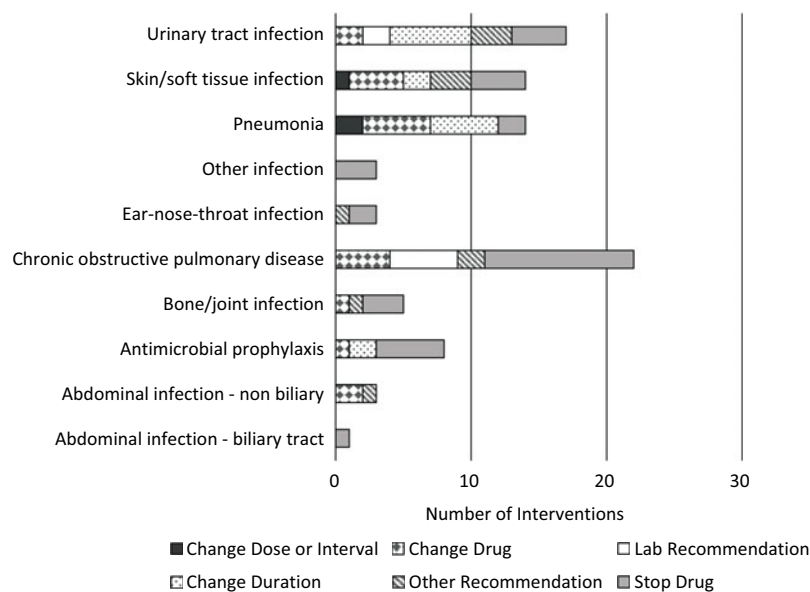


Fig. 2. Recommendation by Diagnosis.

90 (9.7%) prescriptions. The most common reasons for intervention were antibiotic not indicated (43%), incorrect duration of therapy (24%), and preferred alternate antibiotic could have been chosen (23%) (Fig. 1). Recommendations were commonly made to the general medicine (67%) and surgery (20%) services.

In 52 of the 90 interventions (58%), the intervention was unable to be acted upon due to antibiotic course completion. In such cases, intervention was aimed at educating the discharging provider to improve future prescribing. Of the remaining 38 interventions, 22 (58%) were accepted by providers.

Antibiotics commonly intervened on were cefpodoxime (18.8%), azithromycin (18.8%), cephalexin (13.3%), doxycycline (10%), ciprofloxacin (10%), cotrimoxazole (8.8%), and amoxicillin/clavulanate (7.7%). Common disease states intervened upon were chronic obstructive pulmonary disease (COPD, 24.4%), urinary tract infection (UTI, 18.8%), pneumonia (15.5%) and skin and soft-tissue infection (SSTI, 15.5%) (Fig. 2). The most common recommendation was azithromycin discontinuation in COPD patients ( $n = 11$ ).

## Discussion

To our knowledge, this is the second and largest study evaluating AST interventions targeting antimicrobial prescriptions generated

at discharge. In our study, a significant proportion of patients (9.7%) could have benefited from an alteration of antibiotic regimen at discharge. In a retrospective review of 190 charts, Scarpato *et al*<sup>6</sup> reported 70% of antibiotic prescriptions at discharge were inappropriate, and Yogo *et al*<sup>7</sup> determined 53% of antibiotics prescribed to 150 patients at hospital discharge were inappropriate.<sup>7</sup> The discrepancy between our study and these results may be due to inclusion criteria differences. Our study included review of all oral antibiotics, including prophylaxis and long-term suppressive therapy, which were excluded in these studies and may have lowered our intervention rate.<sup>6,7</sup> Additionally, prescribing may have improved during the study period due to education provided, leading to decreased intervention rates compared to retrospective studies.

Recommendations were educational in nature in 52 of 90 interventions (58%) and a prescription change could not be acted upon. AST reviews occurred twice weekly; in many cases, a few days after the prescribed course of antibiotics completed. Thus, review of discharge medications could directly impact patient care to a greater degree if performed prior to discharge.

Intervention occurred in time to modify therapy in 38 cases; 58% of these were accepted. Morton *et al*<sup>9</sup> reported 86% and 68% acceptance rates for verbal and EHR documentation, respectively, in hospitalized patients. Anecdotally, providers appeared to

appreciate the opportunity to discuss antibiotic decisions and welcomed suggestions. We hypothesized that our low acceptance rate might be indicative of increased barriers to intervention unique to discharged patients. Examples include challenges in contacting a patient postdischarge, delivery and cost of an alternative antibiotic, and patient comprehension of regimen changes.

Although 2 studies have reported the impact of AST recommendations made during inpatient rounds on antibiotic discharge prescribing,<sup>9,10</sup> only 1 published study has reported on interventions made at the point of hospital discharge to improve outpatient antimicrobial prescribing.<sup>8</sup> Similar to our study, Yogo et al<sup>8</sup> used a combination of institutional discharge prescribing guidelines and real-time prospective audit and feedback and reported recommendations made to change prescriptions in 23.4% of cases, with a 67% acceptance rate. Although inappropriate prescribing and recommendation acceptance rates in our study are similar, our study adds to the literature by detailing reasons for intervention and corresponding recommendations made, with antibiotic not indicated the most common intervention (43%). To our knowledge, this is the first study published describing antibiotic discharge prescription recommendations. Further studies are needed to characterize interventions and barriers at hospital discharge.

In the setting of limited stewardship resources, targeted review of common conditions requiring antibiotics, including pneumonia and COPD, UTI, and SSTI may be an efficient approach. These conditions accounted for 74.4% of interventions. Limiting review to these diseases and/or antibiotics commonly and inappropriately prescribed may increase review efficiency.

The limitations of our study include the fact the AST was not blinded to prescribers. This factor might have resulted in bias when making recommendations. Our study was performed at a single academic hospital, which may have limited the generalizability of our results. Procalcitonin-guided COPD decision making was introduced as an AST initiative during this period, which likely increased COPD interventions.

In summary, recommendations to providers based on scrutiny of antibiotics at discharge is a valuable tool that ASTs can utilize to promote appropriate antimicrobial therapy. Focusing on common conditions requiring antibiotics, frequently prescribed antibiotics, and timely review will maximize the utility of AST programs. Provider education and participation are key to the success of such programs.

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