

Background

At least 30% of all hospitalized patients receive antimicrobial therapy, and as many as 50% of such therapies are unnecessary or inappropriate.^{1,2} Inappropriate use of antimicrobial agents results in the development of bacterial resistance, which has been shown to increase morbidity and mortality rates, adverse events, and costs.²

There are few new antimicrobial agents currently in development to combat multi-drug resistant organisms. This reinforces the need for judicious use of existing agents. Antimicrobial Stewardship Programs (ASPs) limit inappropriate use of antimicrobial agents and promote optimized regimens (right agent, dose, duration, and route of administration).³

Pharmacists play an important role in ASPs through promotion of optimal use of antimicrobial agents as well as providing education to other health care professionals.⁴

Objective

This study evaluates current antimicrobial prescribing practices to identify areas for practice improvement in preparation for the development of an ASP.

Methods

A retrospective drug utilization evaluation (DUE) was conducted from May 1, 2010 to April 30, 2011 in a western Colorado critical access hospital.

The use of levofloxacin (all 49 cases), ertapenem (all 8 cases), piperacillin/tazobactam (15 randomized cases), and vancomycin (15 randomized cases) was evaluated in adult inpatients. Descriptive data for each case was collected using the patient's electronic medical record and Meditech with documentation on an Excel spreadsheet.

Data included demographics, indication for use, source of infection, microbiology data, serum drug levels, renal function, route of administration, and appropriateness of prescribing for all cases. Analysis was based on pharmacy-specific protocols, plus Infectious Diseases Society of America and Johns Hopkins guidelines, when applicable.

Demographics

The study site is a 25-bed community hospital that employs one hospitalist and serves a rural population of approximately 20,000. The following groups were excluded from assessment: obstetric patients, pre-operative patients, and those under 18 years of age.

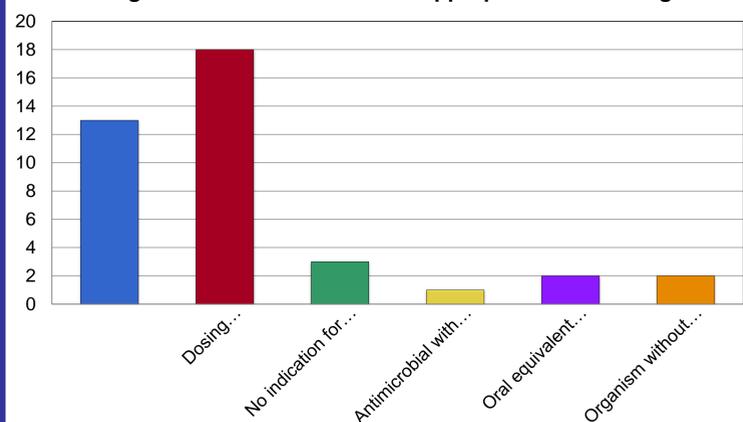
Results

During the study period, a total of 87 cases were reviewed, of which 57 (66%) were deemed appropriate based on established guidelines. Figure 1 illustrates the characteristics of 30 cases that were deemed inappropriate.

- 13 cases (15%) were receiving redundant antimicrobial therapy.
- 18 cases (21%) were identified as requiring a dosing adjustment based on either an inappropriate dose or frequency.
- 3 cases (3%) were determined to have an inappropriate indication for the current antimicrobial.
- 2 cases (2%) had an oral equivalent that was indicated.
- 2 cases (2%) were infected by an organism without antimicrobial coverage.

A total of 18 prescribers were responsible for the utilization of antimicrobials in the study. The hospitalist was involved with the largest proportion of cases (40%). Of his 35 cases, 23 (66%) were deemed appropriate.

Figure 1: Characteristics of Inappropriate Prescribing

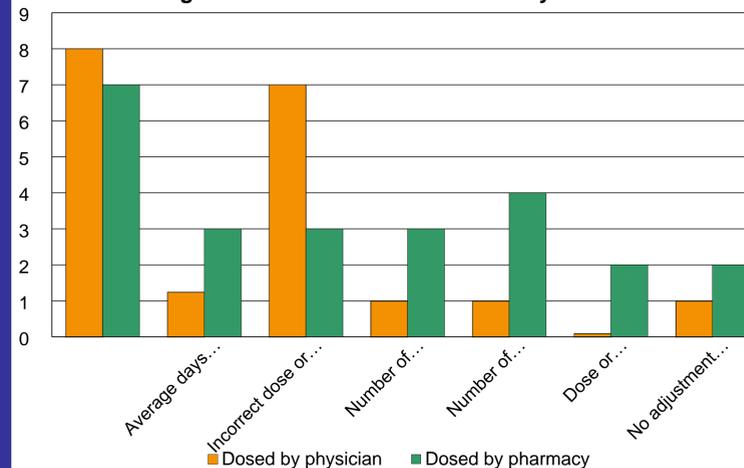


Results

Figure 2 represents data collected from the vancomycin cases. A total of 15 cases of vancomycin were reviewed.

- Of the 8 physician-dosed cases, 88% had either an inappropriate dose or frequency based on Johns Hopkins guidelines.
- Of the 7 pharmacy-dosed cases, 43% had either an incorrect dose or frequency based on pharmacy protocol.
- All 15 patients received vancomycin for an average of 2 days.
- 4 cases required troughs (one case required 2 troughs).
- All troughs were drawn at the appropriate time, and all were out of range, < 10 mg/L, based on the facility's reference range.
- Neither dose nor frequency from the physician's out-of-range trough was adjusted.
- Of the 4 pharmacy-ordered troughs, 2 had adjustments made to the dose, and 2 had no adjustment.

Figure 2: Characteristics of Vancomycin Cases



Discussion

This study was conducted to evaluate current prescribing practices of levofloxacin, ertapenem, vancomycin, and piperacillin/tazobactam in order to facilitate implementation of an ASP. Based on results of the DUE, two common deficiencies in use of the studied agents were observed. First, 21% of the doses/frequencies of the studied agents were not appropriate based on established guidelines. Second, 15% of the cases received redundant antimicrobial therapies. Analysis of the causes of these deficiencies will lead to improved clinical use of the studied agents and potentially improve patient outcomes.

Two changes were implemented during the study period. First, pharmacist intervention documentation in Meditech was discontinued. Due to lack of documentation, pharmacy intervention is now more difficult to track retrospectively. Secondly, a transition from paper to electronic medication reconciliation (eMAR) was made. Previously, many cases (18%) lacked documentation of antibiotic discontinuation at discharge. With the implementation of eMAR, documentation is mandatory and should alleviate this issue.

Implications for Practice

The majority of treatment regimens for the studied antimicrobial cases were consistent with guideline criteria. Of the most common problems, the majority of therapeutic duplications were due to a hospital-specific order set. In regard to inappropriate dosing, further investigation is needed to identify and correct causes. In addition, vancomycin troughs were consistently low. This may be attributed to pharmacists not following the pharmacy's dosing protocol or the need for protocol revision.

The information derived from this study will support efforts to optimize antibiotic usage at our institution. One challenge critical access hospitals face is the lack of specialized practitioners. Without involvement of an infectious disease-trained physician, an ASP may be viewed skeptically by physicians. However, pharmacist-run ASPs have been shown effective at optimizing antimicrobial use, reducing morbidity and mortality, and decreasing costs.⁵

References

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