

# Ertapenem and Surgical Prophylaxis: The Impact of Antimicrobial Stewardship Interventions on Inappropriate Carbapenem Utilization at a Community Teaching Hospital

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## Introduction

- The Centers for Disease Control and Prevention (CDC) have recognized carbapenem-resistant Enterobacteriaceae (CRE) as an urgent threat in the United States.<sup>1</sup> Inappropriate use of carbapenems appears to be a contributing factor in the development of CRE.
- At AtlantiCare Regional Medical Center (ARMC), we have observed an average of 14 CRE isolates per year since 2016. Additionally, there has been a recent outbreak of Carbapenem-resistant *Acinetobacter baumannii* (CRAB) within our region. Internal analysis of ertapenem utilization revealed a significant number of providers using this antibiotic inappropriately for surgical prophylaxis, specifically abdominal procedures.
- In response, the Antimicrobial Management TEAM (AMT) at ARMC delivered a multimodal intervention to promote the appropriate use of ertapenem.

## Objective

- The primary objective of this pre-post study is to evaluate the impact of our interventions on ertapenem utilization for surgical prophylaxis.

## Methods

- From March to October 2019, ertapenem utilization for surgical prophylaxis was analyzed. Our AMT interventions were implemented in June 2019. Reports generated from SurgiNet software were evaluated to identify all antibiotics utilized for abdominal surgical prophylaxis. Data collection included usage of ertapenem and other antibiotics, type of abdominal surgery, and prescriber information. In addition, surgical site infections (SSI) rates were monitored. Appendectomy and trauma cases were excluded.
- The interventions employed by our AMT included the following:
  - Extensive provider education.
  - Review and update of our surgical prophylactic antibiotic protocol (SPAP).
  - Monitoring of policy compliance by adding ertapenem utilization to the division of general surgery quality scorecard.
- The antibiotics recommended in the SPAP are consistent with the American Society of Health-System Pharmacists Antimicrobial Prophylaxis in Surgery guideline.
- As a quality measure, our stewardship initiative was considered successful if monthly ertapenem utilization comprises less than 5% of all prophylactic antibiotics dispensed for abdominal surgery. This 5% threshold allows for cases where ertapenem use may be warranted based on a patient's history.
- In total, 1,080 cases were reviewed. To trend ertapenem utilization, a percentage was calculated for each month by comparing the number of ertapenem cases to the total number of surgical prophylaxis cases.

## Results

Figure 1. Ertapenem Use in Abdominal Surgical Prophylaxis

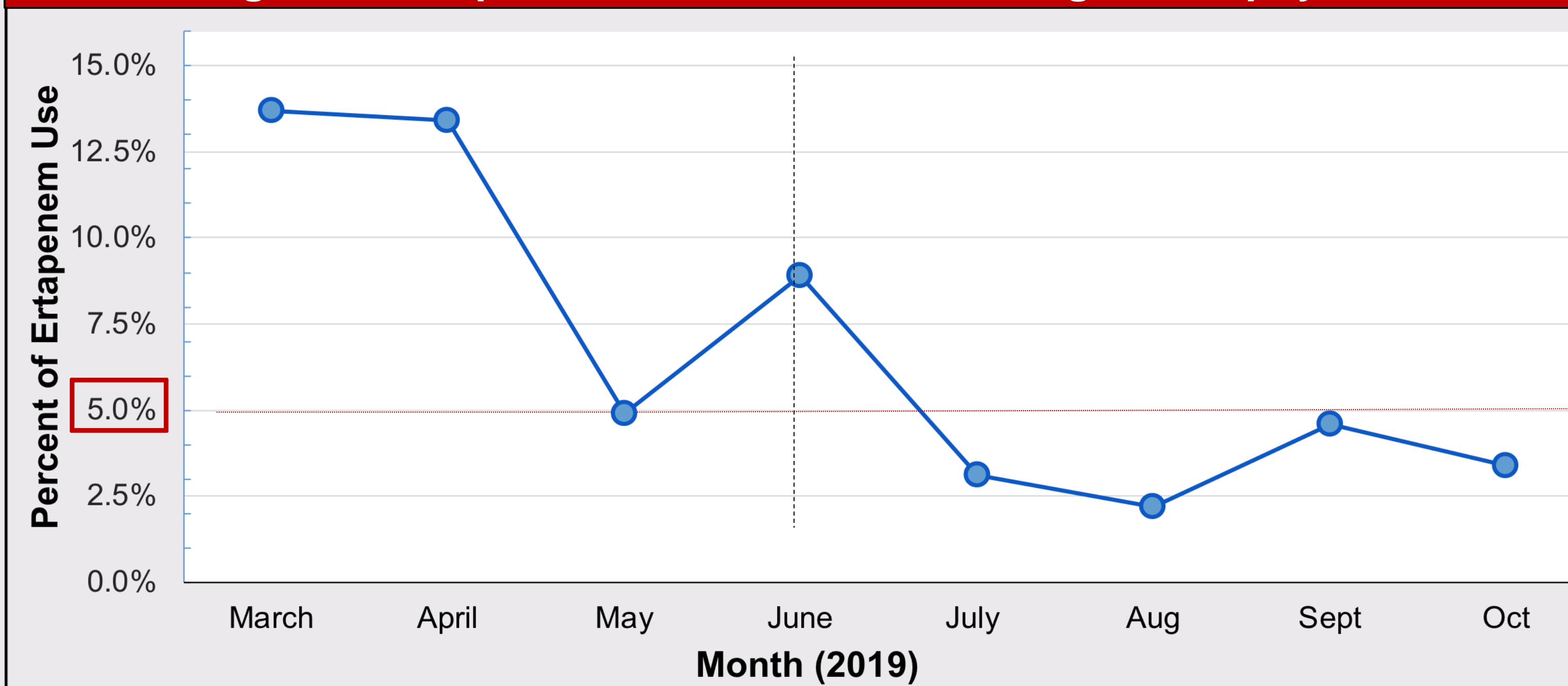


Table 1. Antimicrobial Program Scorecard

Measure	Target	June	July	Aug	Sep	Oct
Number of cases where ertapenem is used pre-operatively		10	3	3	5	5
Number of abdominal surgeries reviewed		112	96	135	110	149
Percent Ertapenem Use in Abdominal Surgical Prophylaxis	<5%	8.9	3.1	2.2	4.5	3.4

## Discussion

- Our AMT delivered effective interventions to minimize prophylactic use of ertapenem (Fig.1), with the quality measure of <5% utilization target achieved each month after June (Table 1). In total, ertapenem use was reduced by 72.4% (Fig.2). Of the abdominal surgeries reviewed, 48% of prophylactic ertapenem use was observed in cholecystectomy cases (Fig.3). The rate of SSI did not increase after AMT intervention, suggesting the alternate antimicrobial agents in the SPAP are safe and effective for surgical prophylaxis in our patient population at ARMC.
- Exclusion of appendectomy cases was a limitation of the study as it was unclear if ertapenem was utilized for prophylaxis or treatment of non-perforated or perforated appendicitis, respectively. Currently, an internal audit is being performed to ensure prophylaxis in appendectomies is managed appropriately.
- As an additional measure to further limit ertapenem use, AMT continues to review surgical prophylaxis computerized provider order entry sets and where appropriate, replaces ertapenem with the antibiotics recommended in our SPAP.

## Conclusion

AMT interventions were successful at reducing prophylactic use of ertapenem through provider education, SPAP implementation, and quality measures. The AMT will continue to identify, monitor, develop, and deliver interventions in an effort to reduce the incidence of CRE and CRAB as a part of the ongoing stewardship service at ARMC.

## References

- Centers for Disease Control and Prevention (CDC). Biggest threat and data. Available at: <https://www.cdc.gov/drugresistance/biggest-threats.html>. Accessed September 2019.
- ASHP Therapeutic Guidelines. Clinical practice guidelines for antimicrobial prophylaxis in surgery. 2013; 654-739. Available at: <https://www.ashp.org/-/media/assets/policy-guidelines/docs/therapeutic-guidelines/therapeutic-guidelines-antimicrobial-prophylaxis-surgery.ashx?la=en&hash=A15B4714417A51A03E5BDCAC150B94EAF899D49B>. Accessed September 2019

Figure 2. Ertapenem Utilization Pre-and-Post Interventions

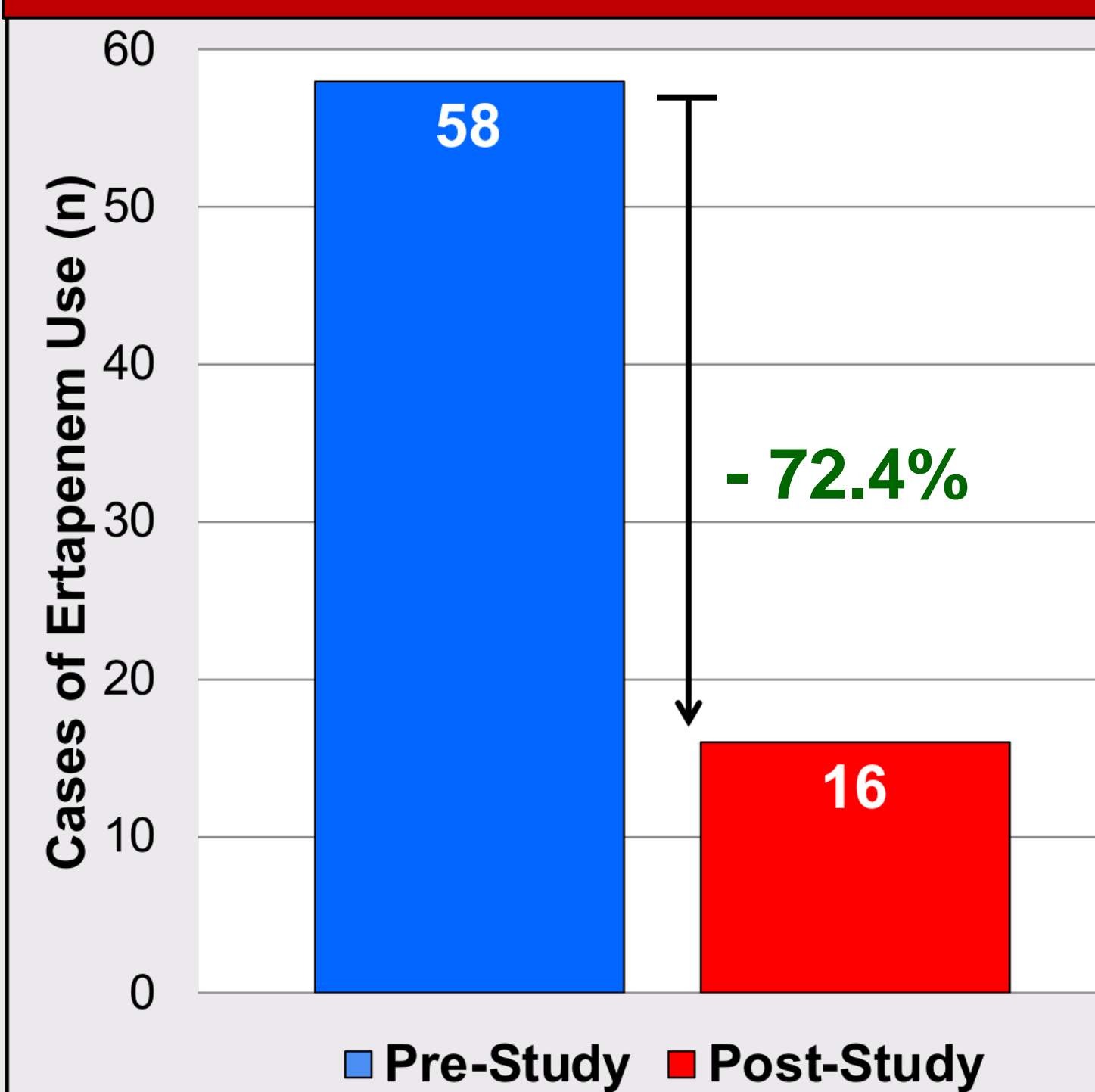


Figure 3. Prophylactic Ertapenem Use by Surgery Type

