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

Shana Szymborski, Pharm.D., M.H.S., Christopher Lewandowski, Pharm.D., Puja Trivedi, Pharm. D., BCCCP, Joseph Reilly, Pharm.D., BCGP, Charles Arrison, RPh

AtlantiCare Regional Medical Center, Pomona, N.J.

Introduction

- The Centers for Disease Control and Prevention (CDC) have recognized carbapenem-resistant Enterobacteriaceae (CRE) as an urgent threat in the United States.1 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. 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. Computer generated reports 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. 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 guidelines.
  - 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
  - Month (2019)
  - Percent of ertapenem use
  - March: 15.6%  April: 15.1%  May: 14.8%  June: 16.9%  July: 15.5%  August: 14.9%  September: 15.2%  October: 16.1%

- Figure 2. Ertapenem Utilization Pre-and Post-Interventions
  - April: 58 cases
  - Post-Study: 16 cases
  - Reduction: 72.4%

- Figure 3. Prophylactic Ertapenem Use by Surgery Type
  - Cholecystectomy: 14%
  - Laparotomy: 23%
  - Laparoscopy: 48%
  - Colostomy: 5%
  - Other/Diagnostic or exploratory: 10%

Table 1. Antimicrobial Program Scorecard

<table>
<thead>
<tr>
<th>Measure</th>
<th>Target</th>
<th>June</th>
<th>July</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of cases where ertapenem is used pre-emptively</td>
<td>10</td>
<td>3</td>
<td>3</td>
<td>5</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Number of abdominal surgeries reviewed</td>
<td>112</td>
<td>96</td>
<td>135</td>
<td>110</td>
<td>149</td>
<td></td>
</tr>
<tr>
<td>Percent Ertapenem Use in Abdominal Surgical Prophylaxis</td>
<td>&lt;5%</td>
<td>14</td>
<td>3.1</td>
<td>2.2</td>
<td>4.5</td>
<td>3.4</td>
</tr>
</tbody>
</table>

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).
- 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, it was removed from all surgical prophylaxis computerized provider order entry sets in November and replaced 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 as a part of the ongoing stewardship service at ARMC.

References