

# A Multicenter Study to Optimize Carbapenem Use

U.S. Department of Veterans Affairs  
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VA



EMORY UNIVERSITY  
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MEDICINE



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## BACKGROUND

- The prevalence of carbapenem-resistant enterobacteriaceae has increased in the United States over the past 20 years,<sup>1</sup> and poses a threat since there is a high mortality associated with these infections and concern for spread of these organisms to the community.<sup>2</sup>
- Furthermore, few antibiotics remain for treatment in patients with these infections.<sup>3</sup>
- Optimizing antimicrobial use is a key element to prevent the emergence of antimicrobial resistance.

## OBJECTIVES

- To examine the appropriateness of carbapenem use at the four Emory-affiliated hospitals in order to identify interventions that can be utilized to optimize carbapenem use.

## METHODS

- A multi-center, retrospective review was conducted across Emory University's four hospitals: Atlanta Veterans Affairs hospital (VA; 173 beds), Emory University Hospital (EUH; 573 beds, Quaternary care hospital), Emory University Midtown Hospital (EUMH; 511 beds, Community/academic hybrid hospital), and Grady Memorial Hospital (GMH; 953 beds, County Hospital).
- 211 charts dated between July, 2015 and December 2015 were reviewed.
  - Inclusion Criteria:** patients who had received a carbapenem for over 24 hours, were over 21 years old, and were registered patients at one of the four Emory-affiliated sites.
  - Exclusion Criteria:** patients who had received only one dose of a carbapenem or received less than a full 24 hours of a carbapenem.

- We developed criteria for empiric (no culture data available) and non-empiric use for carbapenem use (see table 1), and the reviewer applied these criteria to each case.
- The charts were reviewed by one person (A.S.), with a second person (K.M.) who reviewed 10 charts at random from the first site (VA) to ensure validity.

## RESULTS

- From EUH, EUMH, and the VA, 211 charts were reviewed with the following results:
  - Appropriate: 76%
  - Suboptimal: 21%
  - Inappropriate: 3%
- Results from Grady were excluded because an ID consult is required at this hospital to obtain approval for carbapenem use.
  - Inter-observer variation
    - One of the ten charts reviewed by the second reviewer (K.M.) disagreed with the initial review completed by A.S. The chart in question was re-reviewed in it's entirety and a consensus was determined.
  - Microbiology cultures were un-revealing (no growth) in 19.9% (42/211) of cases.

Table 1. Appropriate use criteria

Appropriate	Empiric	Non-Empiric
<ul style="list-style-type: none"> <li>Severe infection and infection in the past 6 months with a beta lactam resistant organism</li> <li>Severe infection, multiple antibiotic given, colonization with a beta lactam resistant organism</li> <li>Severe neutropenia (ANC &lt;100), multiple antibiotic given, colonization with beta lactam resistant organism</li> <li>Concern for ascending pneumonia</li> <li>Persistent fever on hydrocortisone (steroid), already receiving broad spectrum beta lactam</li> <li>Gram stain revealed broad spectrum beta lactam for &gt; 5 day course in the past 30 days</li> <li>Infectious disease consult recommendation or approval</li> </ul>	<ul style="list-style-type: none"> <li>Severe sepsis of unknown etiology</li> <li>Health Care Associated Pneumonia</li> <li>Severe intra-abdominal infection</li> <li>Severe neutropenia (ANC &lt;500)</li> <li>Lab on life threatening diabetic foot or soft tissue infection</li> <li>Urinary tract infection</li> </ul>	<ul style="list-style-type: none"> <li>Carbapenem susceptible organism with no better alternative</li> <li>Culture grew no organism or no organism with susceptibility to other antibiotics</li> <li>Culture no longer culture antibiotic susceptibility</li> <li>Infectious disease consult recommendation or approval</li> </ul>
<p><b>Suboptimal</b> The case does not meet criteria for "appropriate"</p>	<ul style="list-style-type: none"> <li>Penicillin Allergy</li> <li>Treatment of a colonized culture</li> </ul>	<ul style="list-style-type: none"> <li>Continuation of carbapenem for an organism that is susceptible to other beta lactams or a third generation cephalosporin</li> <li>Treatment of a colonized culture</li> <li>Inappropriately long duration of therapy</li> </ul>
<p><b>Inappropriate</b></p>	<ul style="list-style-type: none"> <li>Penicillin Allergy</li> <li>Treatment of a colonized culture</li> </ul>	<ul style="list-style-type: none"> <li>Continuation of carbapenem for an organism that is susceptible to other beta lactams or a third generation cephalosporin</li> <li>Treatment of a colonized culture</li> <li>Inappropriately long duration of therapy</li> </ul>

Figure 1. Reason for inappropriate use of carbapenem (Inappropriate use=6/211)

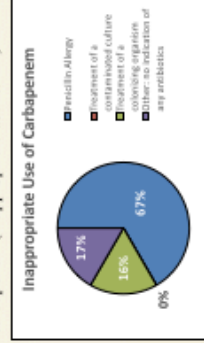
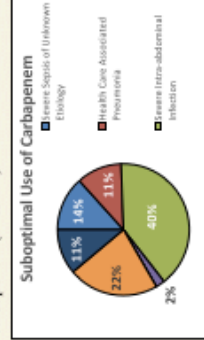


Figure 2. Reason for suboptimal use of carbapenem (n=45/211)



## CONCLUSION

- Of the inappropriate use, four out of six cases occurred in the setting of a beta-lactam allergy.
- The main reasons for suboptimal use were severe intra-abdominal sepsis and limb/life-threatening soft tissue infections.
- These clinical scenarios should be targeted for specific interventions to improve carbapenem utilization.

## DISCUSSION

- Determining the different perspectives and motivations for use of carbapenems at each hospital system may help further elucidate specific targets for intervention.
- Frew et al have completed in-depth interviews with providers to identify perceived attitudes and norms associated with carbapenem use.
- Combining both the quantitative findings from this study with the qualitative results from Frew's interviews, specific targets and interventions can be planned to improve antibiotic stewardship of carbapenem use.

## REFERENCES

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