

BACKGROUND

- Meropenem is a broad-spectrum antibiotic with gram-positive, gram-negative, and anaerobic coverage and is considered a drug of choice for extended-spectrum betalactamase (ESBL) infections.¹
- The prevalence of multidrug-resistant gram-negative organisms has increasingly grown over the years, with the Centers for Disease Control and Prevention listing ESBL-producing Enterobacterales as a “serious” threat.²
- Antimicrobial resistance continues to evolve within the United States which has led to an increased utilization of broad-spectrum antibiotics including carbapenems.
- Evaluation of meropenem use and prescribing is necessary to assess current practices, identify areas of improvement, and promote judicious use of broad-spectrum antimicrobials.

OBJECTIVES

Primary Outcome

- Assessment of overall appropriateness of meropenem use
 - Dose and interval
 - Culture and susceptibility

Secondary Outcomes

- Development of *Clostridioides difficile* infection
- Readmission for same infection within 30 days
- New onset of multidrug-resistant organism
- In-hospital all-cause mortality
- Development of carbapenem resistance

METHODS

Study Design

- Single-center, randomized retrospective chart-review
- This study was institutional review board exempt

Inclusion Criteria

- Adult patients aged 18 through 89 hospitalized from January through July 2021
- Gram-negative culture necessitating treatment during study period
- Received ≥48 hours of meropenem during hospitalization

Exclusion Criteria

- Pregnancy
- Transplant recipients
- Neutropenia associated with immunosuppression
- Initial culture resistant to carbapenems

Data Collection

- The following information was collected from each patient: baseline demographics, source of infection, organism(s) isolated, indication, meropenem dose and duration, concomitant antibiotic(s) and duration, and prior antibiotic history.
 - Appropriateness was assessed based on: carbapenem only susceptibility, culture with ESBL-producing organism, allergy precluded alternative therapy, subjective clinical worsening, simplification of antibiotic regimen, septic shock, and empiric treatment of bacterial meningitis

- Data was analyzed using descriptive statistics

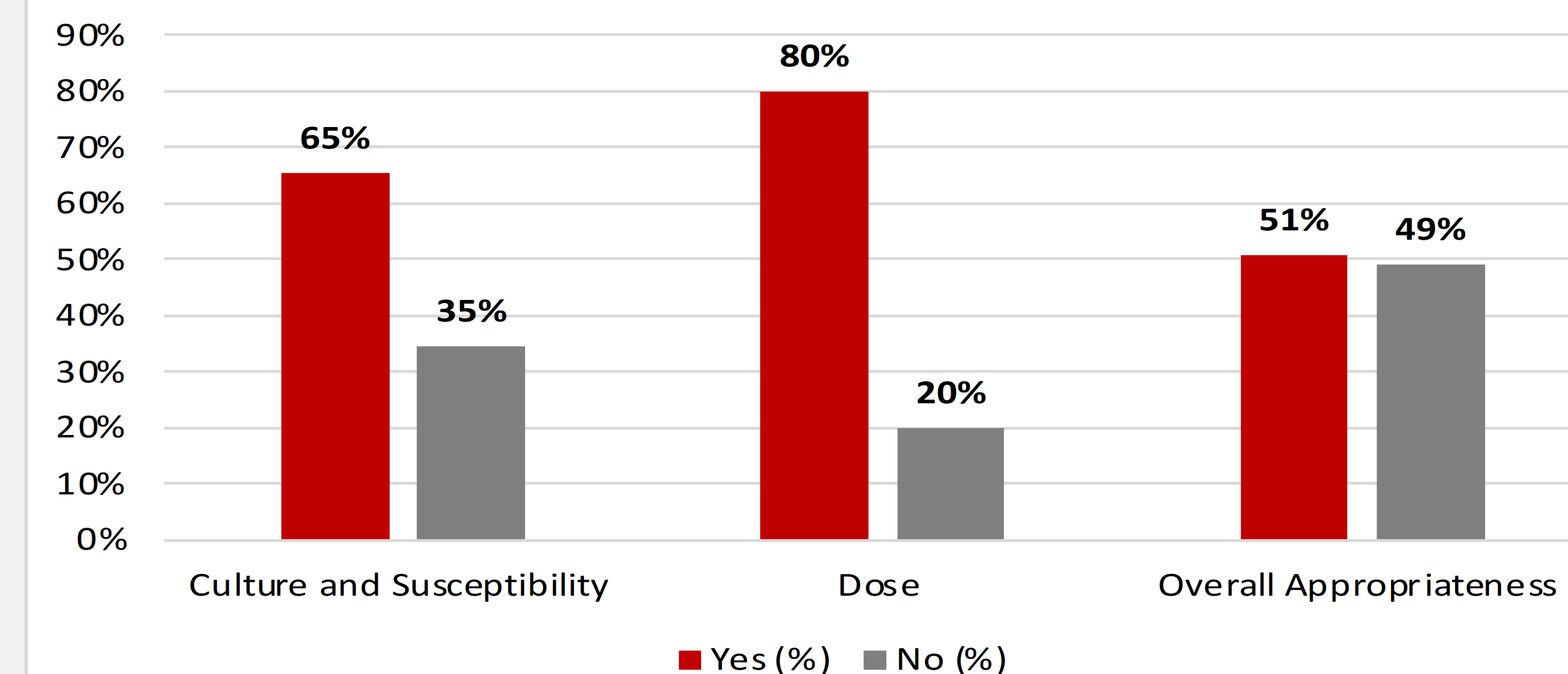
RESULTS

Baseline Demographics	N = 55
Age, years Mean (range)	66 (33-83)
Gender:	
Male	26
Female	29
SCr, mg/dL Mean (range)	1.5 (0.41-6.34)
Inpatient Unit	
ICU	17
Medical Stepdown	6
General Medical	21
Medical Telemetry	11
Length of Hospital Stay, days Mean (range)	16.6 (2-80)
Patients on Mechanical Ventilation	8
Patients with Concomitant Diagnosis of COVID	4
Organism	
<i>Escherichia coli</i>	17
<i>Pseudomonas aeruginosa</i>	10
<i>Klebsiella pneumoniae</i>	9
Other*	19
Indication	
Urinary Tract Infection	27
Pneumonia	10
Skin and Soft Tissue Infection	6
Osteomyelitis	6
Bacteremia	4
Intra-abdominal Infection	2
Duration, days Mean (range)	6.7 (2-32)
De-escalation Based on Culture	
Yes	29

Assessment of Appropriate Use	N=55
Positive ESBL Infection, n (%)	19 (35)
Allergy, n (%)	8 (15)
Subjective Clinical Worsening, n (%)	13 (24)
Septic Shock, n (%)	8 (15)
Carbapenem Only Susceptibility, n (%)	2 (3.6)
Simplification of Antibiotic Regimen, n (%)	2 (3.6)

RESULTS

Appropriateness of Meropenem Use



Secondary Outcomes	N=55
In-hospital all-cause mortality, n (%)	8 (15)
New Onset Multidrug-Resistant Organism, n (%)	6 (11)
Readmission for Same Infection within 30 Days, n (%)	5 (9)
Subsequent Carbapenem Resistance, n (%)	3 (5)

Limitations of the study include:

- Heterogeneity of prescribers
- Small sample size
- Study occurred during COVID-19 pandemic and delta-surge

CONCLUSION

- Overall appropriateness of meropenem use was 51%.
- Appropriate use based on culture and susceptibility was 65% whereas appropriateness of dosing regimen was 80%.
- Of those which were inappropriate, the most frequently identified reason for use was patients with a remote history of self-reported penicillin allergy.

Future Applications

- Targeted prospective audit and feedback with prescribers is necessary for appropriate use of meropenem.
- Provide nursing education and develop standard format to assist with review, clarification, and documentation of antibiotic allergies along with reported reactions.
- Results will be discussed with providers at upcoming Antimicrobial Stewardship subcommittee meeting.

REFERENCES

- Zhanell GG, Wiebe R, Dilay L, et al. Comparative Review of the Carbapenems. *Drugs*. 2007;67(7):1027-1052.
- CDC. Antibiotic Resistance Threatens Everyone. Centers for Disease Control and Prevention. Published June 22, 2021. Accessed September 9, 2021.