RESEARCH PAPER

Antibiotic Escalation Beyond Carbapenems in Severe Hospital-Acquired Infections: A Prospective Observational Study

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ABSTRACT

Background

Rising antimicrobial resistance has led to increasing use of higher antibiotics beyond carbapenems in critically ill patients. However, data on indications and outcomes remain limited.

Aim

To evaluate the indications, microbial profile, and clinical outcomes of antibiotic escalation beyond carbapenems in severe infections.

Methods

A prospective observational study conducted in a tertiary care ICU including 100 patients who required escalation beyond carbapenems. Data on infection source, culture sensitivity, antibiotic usage, and outcomes were analyzed.

Results

The most common indication for escalation was multidrug-resistant organisms (62%), followed by clinical deterioration (25%) and persistent fever (13%). Frequently used antibiotics included polymyxins (40%), ceftazidime-avibactam (35%), and tigecycline (25%). Mortality was significantly higher in patients with delayed escalation (52% vs 28%, $p < 0.05$).

Conclusion

Early appropriate escalation based on clinical and microbiological data improves outcomes in severe infections. Rational antibiotic use is crucial to combat resistance.

Keywords: Antibiotic escalation, Carbapenem resistance, ICU infections, MDR organisms, Polymyxins

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Introduction

Antimicrobial resistance is a growing global concern, particularly in ICU settings where broad-spectrum antibiotic use is common.

Carbapenems have traditionally been the last line of defense against severe infections. However, increasing resistance has necessitated escalation to newer or more toxic agents such as polymyxins and beta-lactam/beta-lactamase inhibitor combinations.

Understanding when and how to escalate antibiotics is critical to improving outcomes while minimizing toxicity and resistance.

Materials and Methods

Study Design:

Prospective observational study

Setting:

Tertiary care ICU

Duration:

12 months

Inclusion Criteria

- Age ≥18 years
- Severe infection requiring ICU admission
- Initial therapy with carbapenem
- Subsequent escalation to higher antibiotics

Exclusion Criteria

- Mild infections
- Outpatient cases
- Incomplete records

Data Collection

- Demographics
- Source of infection
- Culture and sensitivity
- Antibiotic regimen
- Timing of escalation
- ICU stay duration
- Mortality

Statistical Analysis

- Chi-square test
- $p < 0.05$ significant

Results

Baseline Characteristics

- Total patients: 100
- Mean age: 58 years
- Male: 65%

Source of Infection

- Ventilator-associated pneumonia: 40%
- Bloodstream infection: 30%
- Intra-abdominal: 20%
- Others: 10%

Antibiotics Used After Escalation

Antibiotic	Percentage
Polymyxins	40%
Ceftazidime-avibactam	35%
Tigecycline	25%

Indications for Escalation

Indication	Percentage
MDR organism	62%
Clinical deterioration	25%
Persistent fever	13%

Outcomes

Parameter	Early Escalation	Late Escalation	p-value
Mortality	28%	52%	<0.05
ICU Stay	Shorter	Longer	Significant

Discussion

This study highlights the growing need for escalation beyond carbapenems due to rising MDR infections.

Key Points

- Early escalation improves survival
- Culture-guided therapy is essential
- Overuse of last-line antibiotics should be avoided
- Combination therapy may be beneficial in selected cases

Clinical Implications

- Do not delay escalation in deteriorating patients
- Use microbiology support effectively
- Practice antibiotic stewardship

Limitations

- Single-center study
- Limited sample size
- No long-term follow-up

Conclusion

Timely and appropriate antibiotic escalation beyond carbapenems significantly impacts outcomes in severe infections. Judicious use is essential to prevent further resistance.

References (Sample)

1. WHO. Antimicrobial resistance report.
2. IDSA Guidelines for MDR infections.
3. Recent ICU antibiotic stewardship studies.