



# Antibiotic Treatment for Carbapenem-Resistant Enterobacteriaceae (CRE) and Outcomes in Veterans with Spinal Cord Injury/Disorder (SCI/D)



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## Background<sup>1-4</sup>

### CRE

- Highest threat level for antibiotic resistance by CDC
- Optimal treatment largely unknown
- Inappropriate treatment leads to:
  - Increased mortality
  - Increased healthcare costs
  - Longer length of stay

### SCI/D

- 282,000 people (17% veterans) in the US have SCI/D
- Infection is the leading cause of death in this population
- Associated with multi-drug resistant infections, including CRE

## Methods

### Study Objective:

- Describe antibiotic regimens used for treatment of active CRE infection in veterans with SCI/D and the clinical characteristics and outcomes of treated patients.

### Study Design:

- Retrospective cohort study using National VA data sources
- Inclusion Criteria: patients treated at any VA facility from 1/11/2011 to 12/31/2013 with ICD-9 code for SCI/D and active CRE infection
- Exclusion Criteria: patients with ALS or other progressive neurological deficits, patients colonized with CRE
- Additional data collected by manual chart review

### Definitions:

- Empiric: antibiotics used before final culture results
- Definitive: antibiotics used after culture results finalized
- CRE: non-susceptibility of *E. coli*, *Klebsiella spp.*, or *Enterobacter spp.* to ≥1 carbapenem plus ceftioxime, cefotaxime, or ceftazidime
- CRE-Active: CRE is susceptible to antibiotics prescribed
- CRE-Inactive: CRE is non-susceptible to antibiotics prescribed

### Primary Outcomes:

- Type of antibiotics used for empiric and definitive treatment of CRE, including mono- and combination therapy.
- Clinical Outcomes assessed: clinical improvement within 10 days or 11-30 days; microbiological resolution; mortality at 30 days, 90 days, and 1 year; readmissions at 30 days and 1 year

### Statistical Analysis:

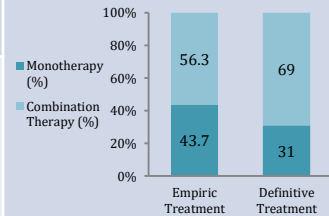
- Fishers exact p-value used to assess associations; alpha set at 0.0125 due to multiple comparisons
- All analyses conducted with SAS software

## Results

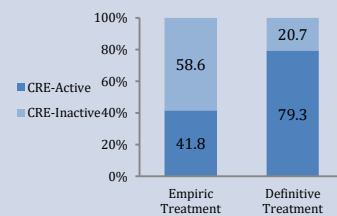
### Baseline Characteristics:

- 87 veterans with SCI/D had infections with CRE during the study period
  - 98.9% male, mean age (years): 66.8 ± 12.8
- There were no differences in patient or SCI/D characteristics by outcome (P>0.0125).

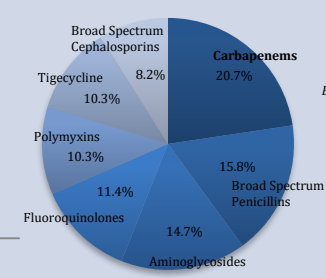
### Combination vs Monotherapy



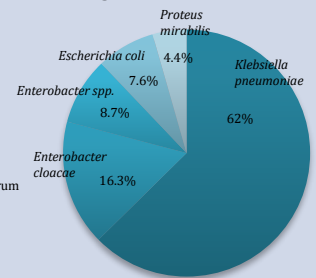
### CRE-Active vs Inactive Therapy



### Antibiotics Prescribed for CRE Treatment



### Organisms Identified as CRE



### Treatment Outcomes Stratified by Empiric/Definitive Monotherapy or Combination Therapy.

Outcome	Empiric Mono (n=38)	Empiric Combo (n=49)	P-Value	Definitive Mono (n=27)	Definitive Combo (n=60)	P-Value
Clinical failure (n=36)	13 (34.2%)	23 (46.9%)	0.3090	8 (29.6%)	28 (46.7%)	0.1896
Clinical improvement in 1-10 days (n=33)	18 (47.4%)	15 (30.6%)	0.0763	13 (48.2%)	20 (33.3%)	0.1299
Clinical improvement in 11-30 days (n=51)	25 (65.8%)	26 (53.1%)	0.7947	19 (70.4%)	32 (53.3%)	0.3138
Microbiologic resolution (n=36)	18 (47.4%)	18 (36.7%)	0.2363	13 (48.2%)	23 (38.3%)	0.2865
30-day readmission (n=9)	3 (7.9%)	6 (12.2%)	0.7272	3 (11.1%)	6 (10.0%)	1.00
1-year readmission (n=28)	12 (31.6%)	16 (32.7%)	0.9660	10 (37.0%)	18 (30.0%)	0.4132
30-day mortality (n=24)	9 (23.7%)	15 (30.6%)	0.5582	6 (22.2%)	18 (30.0%)	0.5390
90-day mortality (n=31)	10 (26.3%)	21 (42.9%)	0.1494	6 (22.2%)	25 (41.7%)	0.1104
1-year mortality (n=38)	12 (31.6%)	26 (53.1%)	0.0689	7 (25.9%)	31 (51.7%)	0.0397

## Conclusions

- The most common pathogen identified as CRE was *Klebsiella pneumoniae* followed by *Enterobacter spp.*
- Carbapenems were the most common antibiotic class for treatment of CRE.
- There was common use of agents typically considered as last-line options due to adverse events, including aminoglycosides, tigecycline, and polymyxins
- Empiric treatment was more often CRE-inactive, whereas definitive treatment was more often CRE-active.
- No statistically significant difference in clinical outcomes was found for combination therapy vs monotherapy as either empiric or definitive treatment.

## References

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## Disclosures

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