

# Incidence of Carbapenem Resistant Enterobacteriaceae (CRE) Bacteremia in Patients Colonized with CRE

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## Introduction

- Antimicrobial resistance is a global threat to modern healthcare, and Carbapenem Resistant Enterobacteriaceae (CRE) are some of the most resistant and difficult to treat organisms isolated.
- Carbapenem resistance can occur if Enterobacteriaceae produce AmpC or extended spectrum  $\beta$ -lactamase in combination with porin mutations or if they produce a carbapenemase enzyme; Carbapenemase Producing Enterobacteriaceae (CPE)
- Since 2009, an outbreak is ongoing in Greater Manchester (GM) area with CPE, predominantly *Klebsiella pneumoniae* Carbapenemase (KPC) producing Enterobacteriaceae.
- Public Health England (PHE) advises screening for CPE in patients who in the last 12 months who have;
  - been an inpatient in a hospital abroad or an inpatient in a UK hospital which has problems with spread of CPE OR
  - have been a 'previously' positive case.
- Despite screening, and early detection of CPE carriers and infection control precautions, bacteremias with carbapenem resistant Enterobacteriaceae have developed in our hospital.
- The primary objective of our study is to investigate the prevalence of CPE bacteremias among CPE positive carriers.

## Methods

- Using our Laboratory Information System all bacteremias caused by CRE performed between January 2014 and January 2016 were identified.
- During the same time period all rectal screens for CPE (both positive and negative) were also identified.
- Growth on selective media was confirmed by modified Hodge test, colistin and temocillin E-tests, and sent to reference laboratory for additional testing.
- Sensitivities were performed by Vitek2 using EUCAST breakpoints and confirmed by reference laboratory.
- Demographic characteristics, patient outcomes, and infection control precautions taken were recorded.

## Results

- During the two year period, 17797 Rectal screens were performed of which 504 (2.8%) were positive (figure 1).

Figure 1. Results of CPE screening

Rectal screens performed

- 17797

CPE positive screens

- 504 (2.8%)

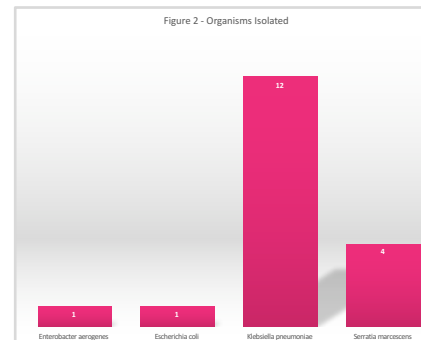
Blood stream infection

- 3 (0.6%)

## Results

- There were 18 positive blood cultures from 13 patients.
- 7/13 (54%) were male, mean age 75.5 years (range 38-90).
- 9 patients have died, deaths occurred between 1-567 days post bacteremia, 5 deaths occurred within 30 days of bacteremia, 8 within 90 days.
- 7 patients had no rectal screening performed, 3 patients had screening performed and screens were negative.
- 3 patients had positive rectal screens prior to development of bacteremia, all developed bacteremia with the same organism. In one patient, the rectal screen revealed a second CRE, *Citrobacter amalonaticus*.
- The majority of blood stream isolates were *K. pneumoniae* (12), others were *Serratia marcescens* (4), *Enterobacter aerogenes* (1), *Escherichia coli* (1) (figure 2).
  - The *S. marcescens* was isolated from a patient transferred from hospital care in Spain.

Figure 2 - Organisms Isolated



## Results

- All isolates produced the KPC enzyme.
- There were 10 bacteremias which occurred in 9 patients in 2014, and 8 bacteremias in 4 patients in 2015 (figure 3).
- Antimicrobial susceptibility of blood stream isolates is presented in table 1.

Figure 3 - Positive CRE Rectal Screens & Blood Stream Infection

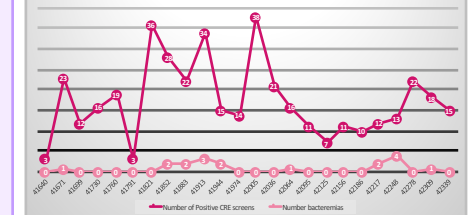


Table 1. Antimicrobial Susceptibility of Isolates

Cumulative Susceptibility	GEN	TOB	AMI	CIP	TIG	TRI	ERT	MER
Total % S	72.2	88.9	100.0	55.6	70.0	50.0	5.6	0.0
Total % I	0.0	0.0	0.0	11.1	10.0	0.0	0.0	0.0
Total % R	27.8	11.1	0.0	33.3	20.0	50.0	94.4	100.0

Abbreviations: Gen, Gentamicin; Tob, Tobramycin; Ami, Amikacin; Cip, Ciprofloxacin; Tig, Tigecycline; Tri, Trimethoprim; Ert, Ertapenem; Mer, Meropenem

## Conclusions

- In our experience, there is a low incidence of bacteremia in patients colonized with CRE. There was also incidences of bacteremia in the absence of proven colonization.
- Almost half of the patients who developed bacteremia had not been screened, and may not have been recognized as being at risk. Further study is required to identify risk factors for the development of CRE bacteremia in this patient group.