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Epidemiology of carbapenemase-producing Gram-negative bacteria in England, 2016–2018: results from the national enhanced surveillance system

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INTRODUCTION

- Carbapenem resistance poses a significant threat to healthcare provision globally
  - Resistance can develop from several mechanisms
- Emergence of acquired (plasmid-mediated) carbapenemases are of particular concern
  - Carbapenemases hydrolyze penicillins, cephalosporins, monobactams and carbapenems, i.e. 'first-line' and 'last resort' antibiotics
  - Ability to transfer between bacterial species
- In May 2015, Public Health England (PHE) launched an enhanced surveillance system to electronically capture data on patients infected/colonised with carbapenemase-producing Gram-negative bacteria[1]
  - Captures patient demographic and epidemiological data on isolates referred to specialist laboratories for confirmatory testing of acquired carbapenemases

METHODS

- Data from the Electronic Reporting System (ERS) for the enhanced surveillance of carbapenemase-producing Gram-negative bacteria were extracted
- Cases were defined as patients with a carbapenemase-producing Gram-negative bacteria isolated from a screening or clinical specimen in England between April 2016 – March 2018
- Cases were de-duplicated for each year of surveillance by:
  - Bacterial species reported
  - Specimen site
  - Resistance mechanism

The aims of our study were to:

- **Describe the epidemiology of carbapenemase-producing Gram negative bacteria in England**
- **Identify high-risk patient groups to inform infection prevention and control interventions**

RESULTS

- 3960 cases included in analysis; descriptive epidemiological summary presented in Table 1
- 70% specimens received by reference laboratory via ERS
- Majority of organisms were isolated from screening specimens (3158, 79.8%)
- Most commonly reported bacterial species :
  - *Klebsiella pneumoniae* (1428, 36.1%)
  - *Escherichia coli* (1122, 28.3%)
- Enhanced data fields poorly completed:
  - Foreign travel (898, 22.7%)
  - Clinical specialty (711 / 3458 admitted patients, 20.6%)

Number of cases	3960
Age in years (median, IQR)	69.5 (55.3–80.0)
	Frequency (%)
Sex	
Female	1789 (45.2)
Male	2167 (54.7)
Residency	
UK resident	2586 (65.3)
Other	199 (5.0)
Unknown	1175 (29.7)
Patient location at time of specimen	
NHS Acute Trust inpatient	3448 (87.1)
General Practice/walk-in centre	167 (4.2)
NHS Acute Trust A&E	159 (4.0)
NHS Acute Trust outpatient	149 (3.8)
Other locations	37 (1.0)

NHS, National Health Service; A&E, Accident and Emergency

Table 1: Epidemiological summary

- Figure 1 shows trend over time
- Most commonly identified carbapenemases were OXA-48-like, followed by KPC and NDM (Figure 2)

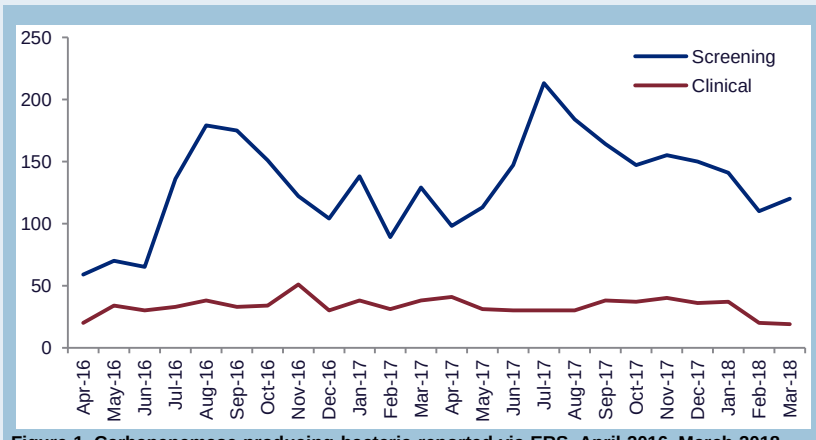

Figure 1. Carbapenemase-producing bacteria reported via ERS, April 2016–March 2018

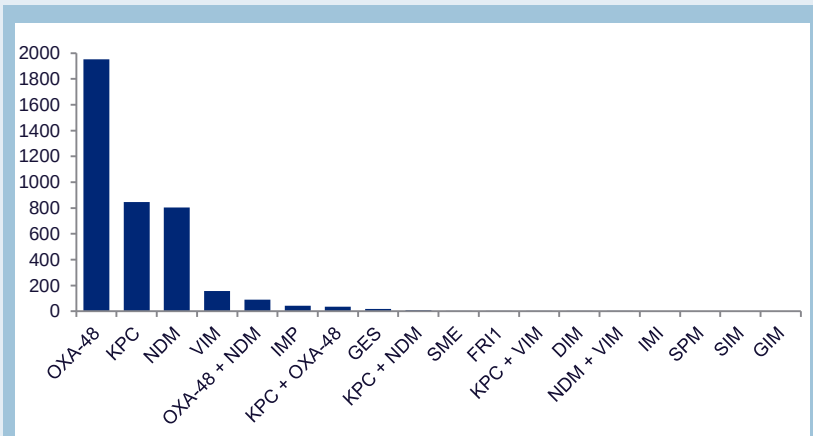

Figure 2. Distribution of resistance mechanisms, April 2016 – March 2018

CONCLUSIONS AND RECOMMENDATIONS

- The enhanced surveillance system is voluntary and poor completion of enhanced data fields is limiting our ability to identify high risk patient groups
  - Furthermore, areas with high prevalence not participating in surveillance
- With more local laboratories able to identify carbapenemase-producing bacteria a new approach to surveillance is required to ensure the comprehensive capture of cases
  - Work is underway to adapt PHE routine national laboratory surveillance system to accept locally-confirmed carbapenemase-producers
- Future work will involve linkage of laboratory and hospital data to allow us to identify patient groups at greater risk and focus control and prevention efforts

ACKNOWLEDGEMENTS

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REFERENCES

1. Freeman *et al*. Enhanced surveillance of carbapenemase-producing Gram-negative bacteria to support national and international control efforts. *Clin Microbiol Infect* (2016); **22**: 896 – 897