Routine identification of carbapenemase-producing Gram-negative bacteria by diagnostic laboratories in England demands surveillance modernisation

Authors: Rachel Freeman[1], Dean Ironmonger[1], Anne Marie O'Connell[1], Neill Keppie[1], Russell Hope[1], Berit Muller-Pebody[1], Peter Staves[1], Katie L. Hopkins[1], Richard Puleston[1], Colin S. Brown[1], Susan Hopkins[1]. National Infection Service, Public Health England, UK[1]

The electronic reporting system (ERS) for the enhanced surveillance of carbapenemase-producing Gram-negative bacteria was introduced in 2015 to capture data on isolates referred for confirmation of carbapenemase production to Public Health England's (PHE) Antimicrobial Resistance and Healthcare Associated Infections Reference Unit. However, an increasing number of diagnostic laboratories are introducing methods to routinely identify carbapenemases.

A questionnaire was sent to PHE Field Service Information Managers. Information Managers conducted telephone interviews with senior laboratory staff and responses were collected and submitted electronically. The survey was open between 11th July – 19th August 2018. Survey responses were cleaned and analysed in Stata version 15.

113/120 (94%) laboratories participated. Eighty (70.8%) laboratories used phenotypic methods for the detection of carbapenemase activity; these results were stored on laboratory information management system (LIMS) in 88.3% of laboratories. However, only 29.6% of laboratories reported using EUCAST screening cut-offs for carbapenem susceptibility testing to determine whether to proceed to local or reference laboratory referral for carbapenemase testing.

Fifty-five (48.7%) laboratories reported use of molecular testing for carbapenemase identification. The most commonly adopted methods were commercial PCR (60.0%) and immunochromatographic assays (43.6%). The majority (>90%) of laboratories could identify isolates harbouring KPC, OXA-48-like or NDM; VIM and IMP could be identified by fewer laboratories (76.4% and 65.5%, respectively). Nearly all (98.1%) laboratories performing molecular testing recorded the results on their LIMS.

Survey participation was high and identified that nearly half of diagnostic laboratories were performing molecular identification of carbapenemases, with more using phenotypic methods to detect carbapenemase activity. However, less than one-third of laboratories were using EUCAST screening cut-offs as recommended in the UK Standards for Microbiology Investigations to identify bacteria requiring further screening for carbapenemases.

With diagnostic laboratories identifying carbapenemases using molecular tests PHE has altered its approach to surveillance. The ERS was decommissioned in April 2019 and modifications were made to PHE's Second Generation Surveillance System (SGSS) to allow diagnostic laboratories to automatically report carbapenemase producers and capture AMRHAI results. This will facilitate linkage to other datasets and will be vital in improving our understanding of the epidemiology of carbapenemases in England, without increasing the data burden on the NHS.