

Advice Statement 005/2016

November 2016

What is the published evidence on the accuracy, turnaround time and cost/cost-effectiveness of tests to identify carbapenemase producing Enterobacteriaceae (CPE) in hospital screening samples obtained from patients identified as at risk of CPE colonisation during clinical risk assessment?



This advice has been produced following completion of [evidence note 62](#) by Healthcare Improvement Scotland, in response to an enquiry from Health Protection Scotland

Background

The rapid emergence and spread of *Enterobacteriaceae* resistant to carbapenems is a critical clinical and public health issue.

Carbapenems are broad spectrum antibiotics important in the treatment of healthcare associated infections. They include imipenem, meropenem, ertapenem and doripenem. These antimicrobial agents may be treatment of last resort for life-threatening infections caused by common intestinal bacteria which have developed resistance to other antibiotics.

Carbapenemase-producing organisms (CPO) may become resistant to carbapenem antibiotics through acquisition of the genes coding for carbapenemases. CPOs include *Enterobacteriaceae* (CPE). *Klebsiella* species and *Escherichia coli* (*E. coli*) are commonly studied examples of *Enterobacteriaceae*, normal human gut bacteria, which can become carbapenem-resistant.

In the UK the number of CPE isolates received by the national reference laboratory has increased continuously since 2008. In 2015 there were 56 CPEs confirmed in samples submitted from Scotland to Public Health England's Antimicrobial Resistance and Healthcare Associated Infections (AMRHAI) Reference Unit at Colindale.

In August 2013 a letter from the Chief Medical Officer, Chief Nursing Officer and Chief Pharmaceutical Officer to NHS Boards in Scotland set out the threat posed by this issue, the increasing instances of CPE detection in Scotland and the principles for combating the threat. In addition to early detection and prudent antibiotic prescribing, the requirement for the implementation of screening and infection control measures was detailed ([http://www.sehd.scot.nhs.uk/cmo/CMO\(2013\)14.pdf](http://www.sehd.scot.nhs.uk/cmo/CMO(2013)14.pdf)). A rectal swab is considered the best sample type for screening in this context. To date the use of screening to identify asymptomatic carriers is variable across Scotland with many NHS boards screening only on an *ad hoc* basis. Patient and staff acceptability associated with collecting rectal swab samples may influence progress. It is estimated that compliance with Scottish screening recommendations would result in 24,000 patients being screened for CPE each year.

Clinical effectiveness

Tests examined were limited to those which were said to offer the ability to identify activity associated with each of the five major carbapenemase groups (KPC, OXA-48, NDM, VIM and IMP). Thirteen tests were identified by the topic referrers.

- There was insufficient evidence to compare the accuracy of screening tests performed using rectal swab samples.
- For more than half of the tests examined there were no diagnostic accuracy studies identified. For each of the other tests there were only a few studies and, although many reported good sensitivity and specificity, the applicability of the findings was limited by the very specific clinical contexts in which they were undertaken and the associated predominant carbapenemase(s).
- Comparison across studies was limited by the lack of a gold standard for detecting CPE in rectal screening samples. A range of reference standards was used in studies.

Safety

- No safety outcomes related to the use of the tests examined were identified.

Cost effectiveness

- No cost effectiveness studies were identified.
- An understanding of the difference in consumables and labour costs for the various screening and confirmation tests and the cost implications of positive and negative results is essential to selecting the most appropriate technologies.
- Genotypic tests cost in the region of £20-£30 per test excluding the capital cost of the platforms needed to perform them. For culture based phenotypic methods, test costs are around £2-£3, with the addition of biochemical methods increasing this to £11-£13.
- The turnaround time for genotypic methods varies from <1 to around 4 hours whilst for phenotypic methods the time to a confirmed result is between 25 and 72 hours.
- The rapid availability of results from genotypic methods may limit the costs associated with unnecessary prolonged isolation of newly admitted patients.

Conclusion

The literature on identifying carbapenemase producing *Enterobacteriaceae* in hospital screening samples is inadequate to inform selection of tests. Considerations around screening test selection should include:

- The prevalence of each carbapenemase in the at-risk population
- Individual clinical microbiology laboratory and overall service capabilities
- The ability to identify high risk patient groups and
- Availability of and costs associated with isolation beds.

Selection of the most appropriate test(s) for NHSScotland will require consensus around the balance between overall costs and turnaround times alongside an understanding of the strengths and limitations of each testing strategy in terms of the accuracy and utility of the information each provides both within a routine screening context and in an outbreak situation.

Advice context:

The status of SHTG Advice Statements is 'required to consider'.

No part of this advice may be used without the whole of the advice being quoted in full. This advice represents the view of the SHTG at the date noted.

It is provided to inform NHS boards in Scotland when determining the place of health technologies for local use. The content of this Advice Statement was based upon the evidence and factors available at the time of publication. An international evidence base is reviewed and thus its generalisability to NHSScotland should be considered by those using this advice to plan services. It is acknowledged that the evidence constitutes only one of the sources needed for decision making and planning in NHSScotland. Readers are asked to consider that new trials and technologies may have emerged since first publication and the evidence presented may no longer be current. SHTG Advice Statements are considered for review on a 2-yearly basis. The evidence will be updated if requested by the clinical community, dependent on new published reports. This advice does not override the individual responsibility of health professionals to make decisions in the exercise of their clinical judgment in the circumstances of the individual patient, in consultation with the patient and/or guardian or carer.

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