Project Title

An Optimised Algorithm with Improved Turn-Around Time for Detection of Carbapenemase-Producing Enterobacterales (CPE) In A Routine Microbiology Laboratory

Project Lead and Members

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Organisation(s) Involved

Ng Teng Fong General Hospital

Aims

Evaluate a new workflow incorporating a rapid immunochromatographic test, the NG Test CARBA 5, for the detection of CPEs

Background

See poster appended/ below

Methods

See poster appended/ below

Results

See poster appended/ below

Lessons Learnt

Advances in the testing array available for CPE detection have enabled laboratories to test directly for presence of the 5 main carbapenemases instead of relying on screening cut-offs, at the same time maintaining or even potentially decreasing the costs incurred during testing

Conclusion

See poster appended/ below

Project Category

Care & Process Redesign

Keywords

Ng Teng Fong General Hospital, Quality Improvement, Carbapenemase-producing Enterobacterales, Immunochromatographic test, turn-around-time, Care & Process Redesign

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AN OPTIMISED ALGORITHM WITH IMPROVED TURN-AROUND TIME FOR DETECTION OF CARBAPENEMASE-PRODUCING ENTEROBACTERALES (CPE) IN A ROUTINE MICROBIOLOGY LABORATORY

MEMBERS: HZ ANG, CH ONG, RATNAYAKE L, CHAN SGD

- ❑ SAFETY
- ☑ PRODUCTIVITY
- ❑ PATIENT EXPERIENCE
- ☑ QUALITY
- ☑ VALUE

Define Problem/Set Aim

Opportunity for Improvement

Rapid and reliable determination of carbapenemase-producing Enterobacterales (CPEs) from surveillance cultures is essential in minimising spread of CPE in our healthcare facility. However, due to the wide variety of carbapenemases and their varying levels of expression, accurate detection requires a combination of testing algorithms, which may potentially introduce delays in reporting turn-around-time (TAT). In this study, we evaluate a new workflow incorporating a rapid immunochromatographic test, the NG Test CARBA 5, for the detection of CPEs.

Establish Measures

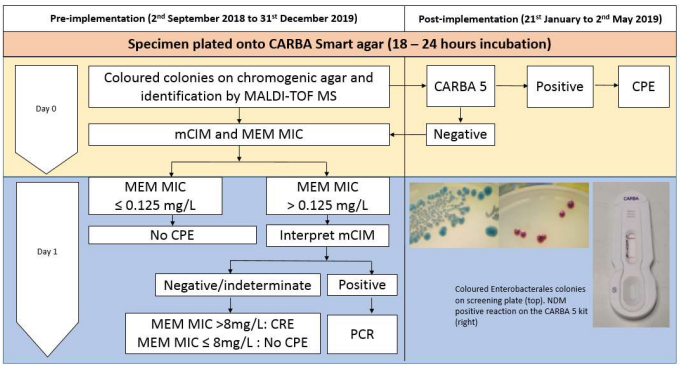

Fig.1: Pre and post implementation workflow

Carbapenemase activity is screened using a combined algorithm of meropenem (MEM) minimum inhibitory concentration (MIC) and modified carbapenem inactivation method (mCIM). Enterobacterales isolates with MEM MIC >0.125mg/L (according to the European Committee on Antimicrobial Susceptibility Testing (EUCAST) recommended CPE screening cut-off) and mCIM positive are reported as CPE. For epidemiological purposes, further genotyping of all CPE isolates were performed using Cepheid's Xpert® Carba-R automated PCR assay.

In January 2019, ourlaboratory implemented the NG Test CARBA 5 into our CPE detection algorithm to shorten our TAT. Efficacy of this implementation is evaluated by analysing TAT for positive CPE cultures, defined as time of identification of Enterobacterales colonies (day 0) to reporting of positive CPE results.

Analyse Problem

Analysis of TAT for CPE cultures from September to December 2018 showed that reporting TAT ranged from 1 to 3 days, with 73.2% CPE positives reported 1 day after growth.

Although definitive detection of CPEs can be performed using the Xpert® Carba-R PCR assay and be reported within the same day as identification of growth, it is too costly to be performed on all active surveillance cultures. The assay is also limited to known targets and requires a screening algorithm to complement it, adding to cost.

Select Changes

Recently, our laboratory evaluated the NG Test CARBA 5, a rapid immunochromatographic test. It is able to detect the 5 main carbapenemases: NDM, KPC, OXA-48 like, VIM and IMP.

We assessed the impact of change for our new CPE screening algorithm based on review of TAT data pre- (September 2018 to December 2018) and post-implementation (January to May 2019) for CPE positive cultures.

Test & Implement Changes

	Old algorithm (2nd September 2018 – 31st December 2018)	New algorithm (21st January 2019 – 2nd May 2019)
Total CPE surveillance cultures	2982	3085
Cultures with Enterobacterales	164 (211 Enterobacterales isolates)	100 (115 Enterobacterales isolates)
CPE positive cultures	41 (45 CPE isolates)	26 (27 CPE isolates)
%CPE positives from cultures with Enterobacterales	25%	26%

Table 1: Active surveillance cultures received during study period and number of CPE positive cultures

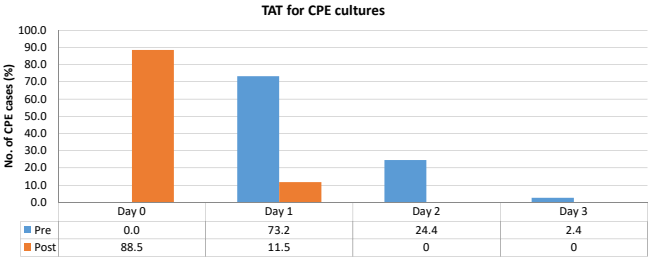

Fig.2: TAT for CPE cultures (in days)

88.5% of positive CPE cases were reported on Day 0 post-implementation of CARBA 5, which is a marked improvement compared to none that could be reported on Day 0 using the old CPE screening algorithm.

Spread Change/Learning Points

Delay in CPE reporting may increase risk of dissemination within hospitals causing outbreaks that are not only costly to control, but potentially also damage the reputation of healthcare institutions. Recent advances in the testing array available for CPE detection have enabled laboratories to test directly for presence of the 5 main carbapenemases instead of relying on screening cut-offs, at the same time maintaining or even potentially decreasing the costs incurred during testing. Implementation of the new CPE detection algorithm incorporating NG Test CARBA 5 has reduced our reporting TAT for CPE positives significantly.

Ng Teng Fong General Hospital
Jurong Community Hospital
Jurong Medical Centre
Members of the NUHS