Evaluation of the Biomerieux Vitek Reveal® and BioFire for rapid identification and antimicrobial susceptibility testing direct from positive blood cultures

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INTRODUCTION

Septic shock and bloodstream infections are often a cause of mortality in hospital patients. Current phenotypic methods to determine the susceptibility profile of a bacterial pathogen are slow, labour intensive, can demonstrate significant technical variability and are often insufficient in such a time-critical diseases. The increasing incidence of antimicrobial resistance, particularly to prophylactic antimicrobials, emphasizes the requirement for novel diagnostic solutions and rapid antibiotic susceptibility testing systems to guide therapy. In addition, rapid susceptibility testing could speed up the de-escalation of antibiotics and provide antimicrobial stewardship rewards. To ensure successful adoption, rapid antibiotic susceptibility testing systems should be accurate, fast, have a broad and relevant antimicrobial panel, affordable, and easy to use. The aim of this work was to evaluate a novel rapid workflow solution involving the Biomerieux Vitek Reveal®, BioFire and MALDI-TOF MS, to provide rapid identification and antimicrobial susceptibility testing direct from positive blood cultures.

METHOD

The study involved 56 positive blood culture samples from patients that had first time pure gram-negative bacteria. In addition to being processed down the routine pathway, blood culture samples were processed down one of three rapid pathways.

- Rapid pathway 1: 46 samples were first run on the BioFire and if identified as one of the following*: A. baumannii, E. cloacae, E.coli, K.aerogenes, K.oxytoca, K.pneumoniae, P.aeruginosa*, the samples were subsequently loaded onto the Vitek Reveal® platform.
- Rapid pathway 2: 5 samples were identified on the MALDI-TOF MS and run on the Reveal. For those identified on the MALDI-TOF MS the Reveal will also work on *P. mirablis, C. freundii* and *C. koseri*, however identification is not covered on the BioFire.
- Rapid pathway 3: 5 samples were loaded onto the BioFire and the Vitek Reveal® at the same.

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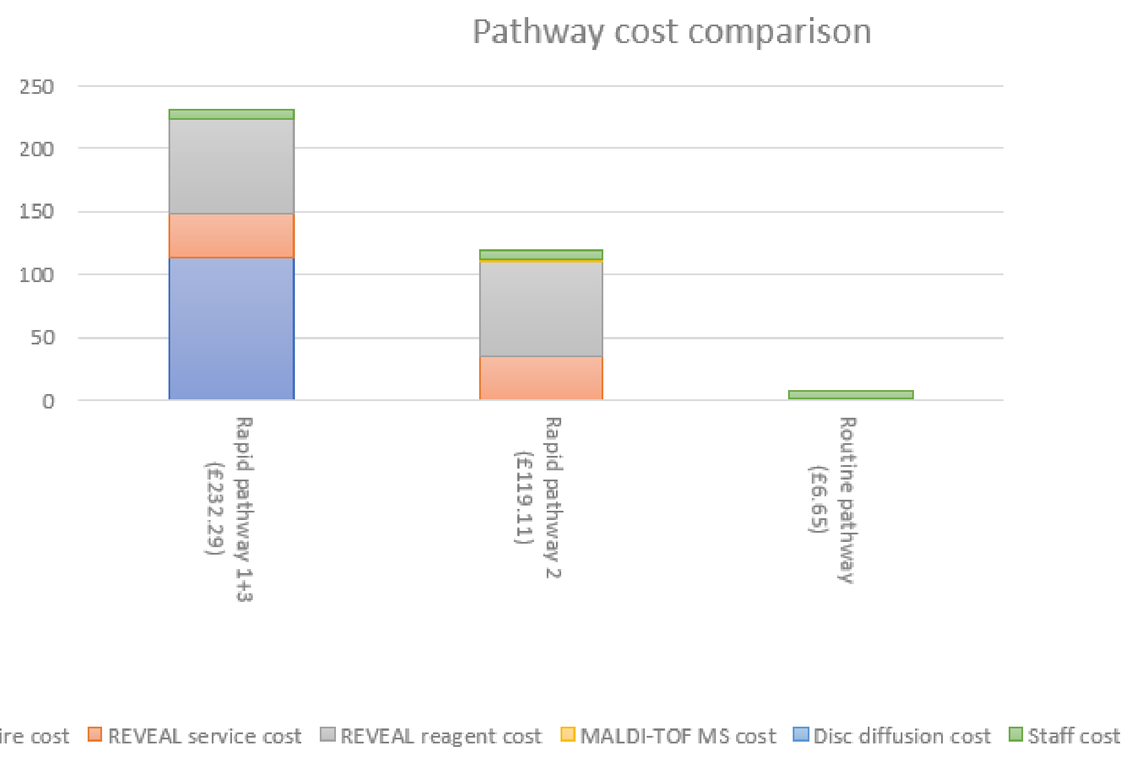
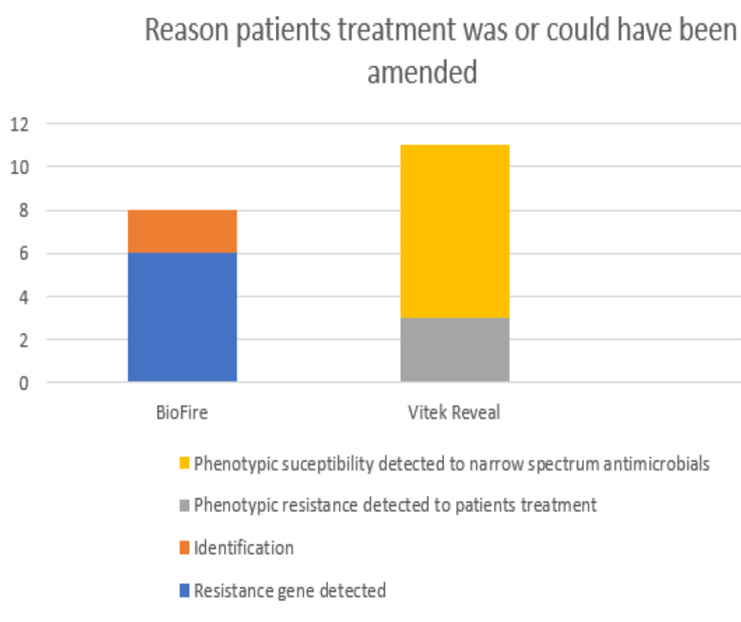
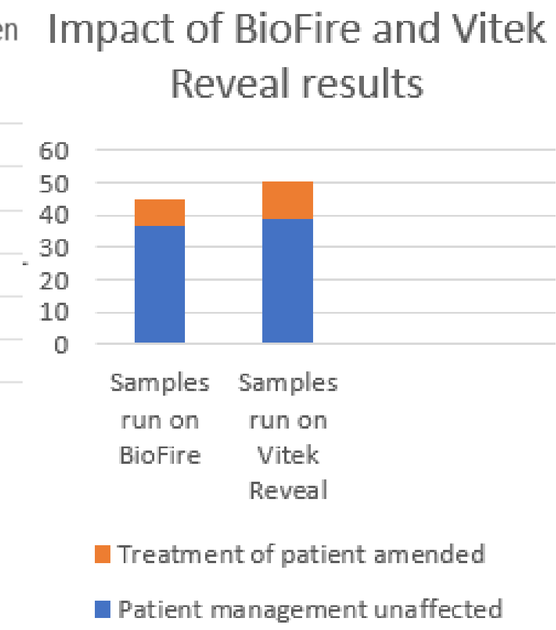
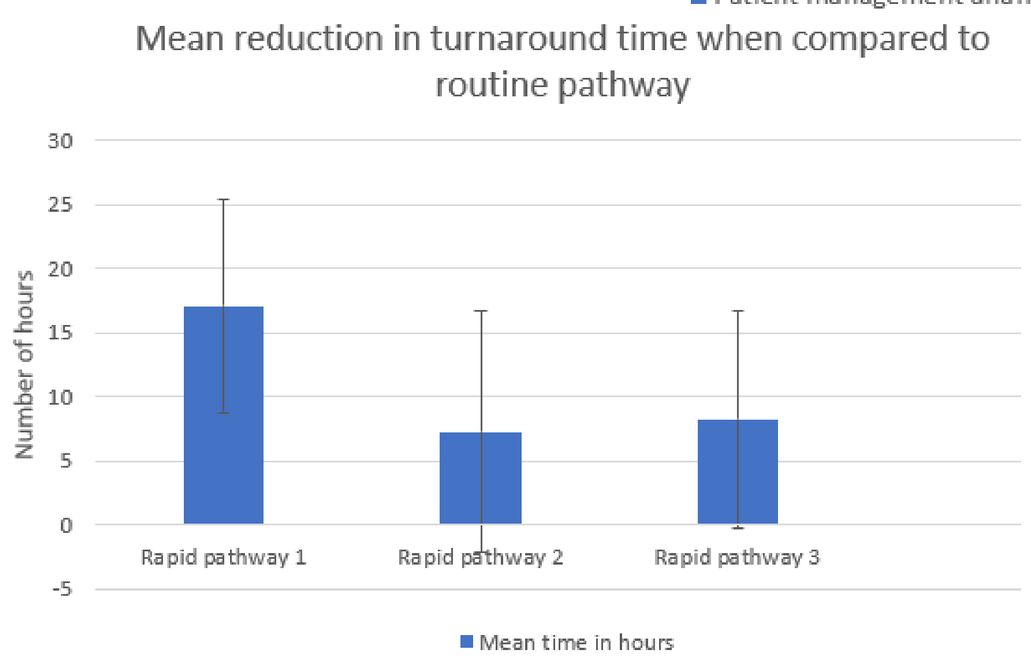
RESULTS



RESULTS (continued)







DISCUSSION

Improvements in availability of antimicrobial susceptibility results were seen with all three rapid pathways. Rapid pathways 1 and 3 were the most expensive, with rapid pathway 1 being the preferable pathway due to its consistent ability to provide a respectable reduction in turnaround time and ability to minimise Vitek Reveal® wastage. Additionally, when investigating discrepant results, the Vitek Reveal® was able to outperform disc diffusion and gradient strip tests by providing results that were more comparable to broth microdilution. If implemented multiplex PCR and rapid AST would remain as an addition to culture-based approaches, for at least the forceable future.

As can be seen in the results section, there were a significant number of real and potential improvements that could be made when processing samples rapidly. However, as the clinical impact assessment was carried out retrospectively, it was challenging to determine the effect of the results, due to several reasons. Within the laboratory, if there is no change in how blood culture antimicrobial susceptibility results are managed out of hours, it may be of benefit to determine timing protocols for processing the samples on the Vitek Reveal (Girlich, 2024).

In summary the potential of the rapid pathways were hindered using the current reporting system. However, rapid workflow solution provided significant time saving advantages and the increase in cost of the test can be offset with wider savings to the Health Board (Nathwani *et al*, 2019)

Quote from project participant: *"This project has the potential to improve patient care, provide antimicrobial stewardship rewards and tackle the increased incidence of antimicrobial resistant organisms"*

REFERENCES

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Nathwani. D., Varghese. D., Stephens. J., Ansari. J. *et al* (2019). Value of hospital antimicrobial stewardship programs [ASPs]: a systematic review. *Antimicrobial Resistance Infection Control* 8, (35).

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