

Integration of a New Diagnostic Test with Antimicrobial Stewardship in a Community Hospital

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1. Introduction

Several studies showed timely and appropriate antibiotic therapy as the single most important predictor of mortality. Timely knowledge of antimicrobial susceptibilities could also impact on patient outcomes.

2. Objectives

The objective of this study was to evaluate whether a new rapid diagnostic test (RDT) directly from the blood culture bottles (Accelerate Pheno™) coupled with ASP intervention optimizes antimicrobial use and affects outcomes.

3. Methods

All positive blood cultures between May and December 2017, after the introduction of the RDT at a large community hospital were reviewed prospectively. The RDT implementation was integrated with an ASP intervention. The protocol (Fig.1) involved communicating the blood culture results to the physician when gram stain and RDT identification of organism were available. The results were also notified electronically to ASP members and the MIC portion of the RDT was electronically updated. ASP called physicians if antimicrobial adjustments were felt necessary.

4. Results

There were 652 positive blood cultures of which 139 were excluded from the analysis: 90 unable to identify (13.8% of total), 11 polymicrobial, 38 had incomplete data. Included in the analysis were 513. There were 363 (71%) gram positives, 146 (28%) gram negative rods and 4(1%) yeast.(Fig.2) For the organisms that were identified the concordance rate was 98.3%.

The average times from blood culture positivity calculated for the sample were as follows: 4.69 hours to organism identification by RDT, 10.9 hours to MIC by RDT, 25.7 hours to antimicrobial changes as result of ASP intervention, 29.2 hours to traditional method (MALDI-TOF) identification and 50.32 hours to MIC by traditional method (Vitek2). (Fig.3) We also noted a decrease in sepsis due to bloodstream infections(BSI) as a percentage of total inpatient mortality, from 10.9% on average for the seven months prior to RDT implementation to an average of 7% for the duration of the study, with a consistent downward slope. The data shows a statistically significant decrease in inpatient mortality in proven BSI; the rate of decrease is estimated at 0.27% per month with a 95% confidence interval of (0.12%-0.41%) per month, $p=0.001$. (Fig. 4) In addition, the average number of antibiotic days per patient encounter was reduced by one full day, from 6.8 days to 5.8 days from January 2017 to November 2017.

Fig.1

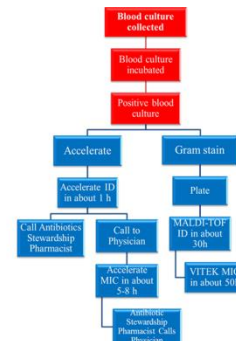


Fig. 2

Percentage Organisms by Type

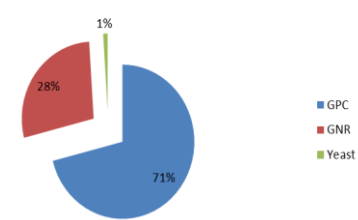


Fig. 3

Timeline - Average Time to Antibiotic Change with ASP Intervention

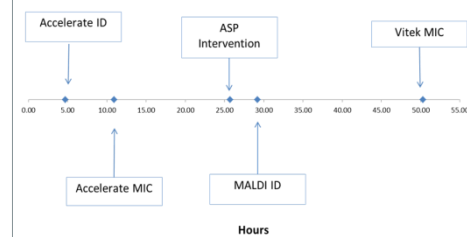
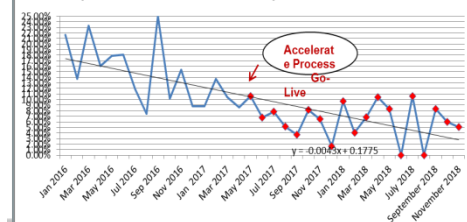


Fig. 4

Mortality Among Proven Bacteremic Sepsis patients as a Percent of Inpatient Mortalities



5. Conclusions

Implementation of a new RDT along with ASP assistance achieved faster and reliable identification of organisms, shortened the time to optimal antimicrobial therapy and reduced the average number of antibiotic days per patient encounter. The sepsis from BSI mortality decreased as well but other factors may have impacted this finding.

6. References

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- 4)MacVane et al. 2016. Benefits of Adding a Rapid PCR-Based Blood Culture Identification Panel to an Established Antimicrobial Stewardship Program. *J Clin Microbiol.* 2016 Oct;54(10):2455-63. doi: 10.1128/JCM.00996-16