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Comparison of the Accelerate Pheno rapid diagnostic system with standard of care for diagnosing Gram-negative bloodstream infections: bacterial identification, antimicrobial sensitivity and turnaround time

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Background: The Accelerate Pheno system (AXDX) is a diagnostic assay providing rapid identification (ID) of bacteria and yeast from blood cultures, as well as phenotypic antimicrobial susceptibility testing (AST). This multicentre study evaluated the accuracy and rapidity of AXDX in characterising Gram-negative bloodstream infections (BSI) in comparison with standard of care (SOC).

Materials/methods: Positive blood cultures with Gram-negative bacteria from three hospital sites were processed in parallel using AXDX and SOC (MALDI-TOF for identification, VITEK2 for AST). ID discrepancies between AXDX and SOC were classified as either false positive or false negative. Categorical agreement (CA) occurred when AXDX and SOC had the same interpretation of susceptibility of the isolate/antibiotic combination. 'Very major errors' (VME) occur when AXDX reported susceptibility but SOC resistance.

Multidrug-resistant organisms of interest (MOI) are those resistant to co-amoxiclav and gentamicin. Time difference to AST between AXDX and SOC was calculated for these MOI if patients were on inactive therapy as identified on chart review.

Results: 148 blood cultures were included. Of these, 141/148 (95.2%) had valid, reportable results on AXDX. 148 organisms were identified. 133/148 organisms were 'on-panel' Gram-negatives. AXDX identified 126/133 organisms correctly (sensitivity 93.3%). 1,128 Gram-negative probes were deployed with 4 false positive results giving a specificity of 1124/1128 (99.6%). From AST, CA was 94.9% (1,270/1,338). There were only 4 VME out of 262 resistant AST results. Turnaround time (TAT) for both ID and AST were calculated for AXDX and SOC. Timing data was available for 111/141 (79%) of blood cultures. Compared with SOC, AXDX gave an average reduction in ID TAT of 16.8 hours (CI 15.1-18.4 hours, $p<0.0001$) and an average reduction in AST TAT of 31.2 hours (CI 29.9-32.5hrs, $p<0.0001$).

There were 15 MOI. 9 of these patients were on inactive therapy, for whom AXDX gave an average time saving to AST results of 12hrs 04min.

Conclusions: AXDX provides accurate ID and AST for Gram-negative BSI, and has a significantly improved TAT that may optimise antimicrobial therapy.