P0285
Paper Poster Session
Non-culture techniques for challenging situations in diagnostics

Rapid detection of resistance traits in blood cultures of patients with bloodstream infections: systematic review and meta-analysis of diagnostic test accuracy.

Giulia De Angelis*[1], Flora Marzia Liotti[1], Giulia Menchinelli[1], Tiziana D'inzeo[1], Barbara Fiori[1], Flavio De Maio[1], Martina Andrenacci[1], Maurizio Sanguinetti[2], Teresa Spanu[3]

[1]*Università Cattolica del Sacro Cuore, Rome, Italy*

[2]*Institute of Microbiology - Università Cattolica del S. Cuore, Roma, Italy*

[3]*Catholic University of Rome, Rome, Italy*

Background: Prompt start of optimal antibiotic therapy impacts significantly on mortality of patients with bloodstream infections. This is even more challenging in settings where multidrug resistant bacteria are common. Culture-based methods require time to identify the infecting pathogen and to provide its antimicrobial susceptibility profile, delaying initiation of adequate treatment. Recently, several molecular-based and non molecular-based tests have been developed to provide early detection of specific resistance mechanisms directly from positive blood cultures.

Material/methods: Related literature on Medline, Embase, and Cochrane databases was searched up to October 2015 for studies utilizing rapid method for detection of antimicrobial resistance traits directly on blood cultures and that provided sufficient data to construct two-by-two tables. Overall estimates of the sensitivity and specificity by bivariate model for diagnostic meta-analysis were provided for groups of studies >4.
Results: A total of 45 studies enrolling 5960 bacteria from blood cultures were included in the review. Twenty-two studies evaluated methicillin-resistance detection in staphylococcal isolates, 4 studies vancomicin-resistance in enterococci and 19 studies extended spectrum beta-lactamases (ESBL) and carbapenemases production in gram negative bacteria. The following overall sensitivity and specificity results for molecular-based methods were recorded, respectively: *mecA* (19 studies, 2983 bacteria), 0·98 (95% CI: 0·95–0·99) and 0·99 (95%CI:0·97–0·99); ESBLs and carbapenemases (12 studies, 1244 bacteria), 0.92 (95% CI: 0·71–0·98) and 0.99 (95% CI: 0·97–0·99). High positive and low negative likelihood ratios were found in both cases. Sensitivity and specificity to detect *vanA* and *vanB* was 100% and 100% in all the 4 studies, except in one where sensitivity declined to 95.8%. Results of studies investigating the accuracy of biochemical tests to detect ESBLs and carbapenemases (2 Carba NP, 1 ESBL NDP and 1 β-LACTA test) and methicillin resistance (2 phenotypic phage-based assay, 1 direct cefoxitin disk diffusion test) varied between 95.7 to 100% and 95% to 100% (sensitivity) and 100%, and 96.4% to 100% (specificity). Variable sensitivity (from 99-100%) and specificity (from 90% to 100%) was reported in 3 studies on mass spectrometry to detect carbapenemase and ESBL producing *Enterobacteriaceae*.

Conclusions: This is the first systematic review and meta-analysis evaluating the diagnostic accuracy of rapid tests to detect markers of antibiotic resistance directly on blood cultures. Despite considerably expensive, molecular-based methods seem to provide high diagnostic and both rule-in and rule-out values of the most important antimicrobial resistance phenotypes. More studies are needed to investigate the role of phenotypic methods, which is already promising.