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Title: *Measuring the Accuracy of Pathogen Identification and Resistance between Genetic (PCR) Technology vs Standard Culture ID/Susceptibility in Bloodstream Infections*

Abstract

Purpose: Rapid diagnostic technology for bloodstream infections is an area of growing interest in infectious diseases. The primary objective was to evaluate the accuracy of a multiplex polymerase chain reaction system (rapid PCR technology for species identification plus genetic resistance markers) in comparison to the current gold standard for culture/susceptibility testing (automated susceptibility testing). The multiplex PCR results are completed in two hours, whereas the current standard can take up to three days for cultures/sensitivities. This reduced turnaround time may result in improved patient care and cost savings.

Methods: This was an IRB approved, retrospective analysis that assessed blood culture results that were collected from May 1st, 2018 to April 30th, 2019. Inclusion criteria consisted of samples with both PCR results from the multiplex PCR system in addition to standard cultures/susceptibilities from automated susceptibility testing. There was no limit to the age range of patients included. Results from the PCR system were compared for appropriate identification of the pathogen and the appropriate resistant genes/susceptibilities. Isolates that were mismatched between the results were labeled as a mismatch. Patients with multiple admissions/blood samples in a single admission were counted as individual samples. The total number of mismatches was calculated and the final rates of mismatches were calculated for both Staphylococcus aureus and coagulase negative staphylococci.

Results: There were 913 positive blood cultures that had both rapid diagnostic results and the standard cultures/susceptibilities. The BioFire was able to positively identify 99.3% of the pathogens, with the only pathogens misidentified being three CONS species and two Enterobacteriaceae species. The BioFire accurately identified all (100%) of the methicillin resistant and susceptible isolates of staphylococcus aureus and vancomycin resistant/susceptible isolates of Enterococcus species. The BioFire was only able to correctly identify 92.8% of CONS species in terms of oxacillin resistance. A total of 26 CONS isolates were mismatched in terms of oxacillin resistance. Reasons for mismatch include oxacillin resistant isolates with no mecA detected by the BioFire (10/26), oxacillin susceptible isolates with mecA detected by the BioFire (10/26) and samples having polymicrobial results with both resistant and susceptible strains (6/26).

Conclusion: With rapid diagnostic PCR technology, such as the BioFire, blood culture analysis occurs much faster, which leads to appropriate antibiotic therapy changes sooner. Our study showed the BioFire can accurately detect pathogens in blood cultures. With pathogens like staph aureus and enterococcus, it is safe to de-escalate antibiotics based on BioFire results alone due to the BioFire results being 100% accurate.