28th ECCMID EUROPEAN CONGRESS OF CLINICAL MICROBIOLOGY AND INFECTIOUS DISEASES
Madrid, Spain
21 – 24 April 2018

P0134 Case-based reasoning for individualized antimicrobial selection: can intelligent decision support improve antimicrobial management?

Timothy Rawson*[1], Bernard Hernandez[1], Oliver Blandy[1], Luke Moore[2], Pau Herrero[1], Esmita Charani[1], Mark Gilchrist[3], Christofer Toumazou[1], Shiranee Sriskandan[1], Pantelis Georgiou[1], Alison H. Holmes[1]

[1]Imperial College London, *[2]Chelsea & Westminster Hospital NHS Trust*, *[3]Imperial College Healthcare NHS Trust*

Background: Clinical decision support tools (CDSS) for antimicrobial management require the flexibility to adapt to inter-individual variations in clinical practice. Case-Based-Reasoning (CBR) is a type of artificial intelligence that facilitates reasoning by remembering previously solved cases that are similar. We investigated a CBR algorithm that was developed for antimicrobial selection in general medicine.

Materials/methods: Data from patients diagnosed with *E.coli* blood stream infection (BSI) were interrogated. Patient demographics, clinical parameters, treatment history, and outcomes of therapy were extracted. A CBR algorithm containing 45 clinical and laboratory variables was optimised for the current dataset. It was trained with 85% of the cases. 15% of randomly selected cases were used for testing. A sequential least squares programme was utilised to investigate the major drivers for decisions made by the CBR algorithm during the optimisation process.

For evaluation of the CBR algorithm, antimicrobial recommendations were compared to clinical practice, local guidelines for therapy, and *in-vitro* susceptibility data for isolated organisms. The spectrum of the antimicrobial recommended was estimated to allow comparison between clinical practice and CBR.

Results: In total, 130 prescribing cases were extracted with 20 forming the test set. In practice, 25 antimicrobial agents had been prescribed either individually or in combination. Amoxicillin/clavulanate (47) and piperacillin/tazobactam (41) were the most common. The CBR algorithm was optimised to use 10/45 variables. Lactate was found to be the main driver of the CBR recommendations.

In the test cohort, median (range) age was 75(24-106) years. The majority of cases were male (14/20;70%). Suspected diagnosis at presentation was BSI (9/20;45%), urine (4/20;20%), or other (7/20;35%) infection. Appropriateness of therapy (*in-vitro* susceptibility) was identical between the CBR recommendations and practice (16/20;80%). However, 6/20(30%) CBR recommendations made were for narrower-spectrum regimes. 2/20(10%) CBR recommendations were unnecessarily broad. The most common recommendation was amoxicillin/clavulanate +/- an aminoglycoside (17/20;85%).

Conclusions: CBR performed in a similar fashion to clinicians for patients presenting with *E.coli* BSI. Lactate was a major driver of escalation of therapy by the algorithm. Further work is required to optimise the training of such algorithms and explore their utility across different clinical scenarios.