An Algorithmic Approach with Matching Theory for Effective Prediction of Kidney Waitlist Times and Post-Transplant Survivability

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Organ transplantation and efficient ways to allocate organs to recipients with the greatest need has been highly debated. Optimizing the system of organ allocation could mean shorter wait-times and by extension, greater survival rates of recipients. The purpose of this work is to develop an algorithm-driven decision support system (DSS) and a computer application for predicting the number of waitlist days and post-transplant survivability. This will be achieved through independent variables such as donor's age, recipient's blood group, age, calculated body mass index, serum creatinine, albumin, diabetes and hepatitis antigen. The dataset for this work was obtained from the United Network of Organ Sharing. Statistical Analysis System (SAS) version 9.4 and Microsoft Excel will be used to perform analysis and develop models 'waitlist days' (WLD) and 'survival days' (SLD) as dependent variables. The work demonstrated that by developing this DSS, patients can be informed of the average WLD for their specific situation and potential survival days, while medical professionals can decide on which patients should first receive an organ, thereby supporting the organ matching theory. This work also used the models' artificial intelligence and developed a computer application to predict WLD and SLD. With additional data in the future, a machine learning approach can be used to refine these WLD and SLD models for improving their accuracy. Using the DSS such as the one presented here, on a universal scale, organs can be allocated much faster across the network of hospitals and medical institutions.