A Participant-Specific Estimate of Expected Organ Quality in Kidney Paired Donation

Durvasula, Naveen

Patients with end-stage renal disease may receive a kidney transplant from a deceased or living donor. However, kidney transplants are time-sensitive and not all kidneys have the same expected lifetime. A tool that can tell doctors which kidney offers the greatest expected lifetime can increase a patient's chance of survival. The Kidney Donor Profile Index (KDPI) and the Living Kidney Donor Profile Index (LKDPI) are scoring systems used to describe the quality (expected lifetime) of a deceased-donor and living-donor kidneys, respectively. Currently, there exists no means to determine a patient's expected outcomes in a kidney paired donation (KPD) system. This project creates a framework for computing the expected LKDPI, or quality, of the kidney that a patient in a KPD system would receive, as well as how long it will take to get matched in KPD. Estimates for a given pair were generated using Monte Carlo simulation based on 1) published donor/patient data describing the distribution of donors and patients that enter and exit a US KPD system and 2) the UNOS KPD matching policy. Computations for a single pair can take days, so a pre-processing scheme is necessary. Different sampling methods were created and compared based on total computational time and the error in calculating kidney quality and time to match. With accurate sampling, doctors can have instantaneous access to valuable insight regarding a patient's expected outcome in a KPD system.

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