Department

of

Engineering Management, Information, and Systems

Modeling Kidney Transplantation Decisions: Regulatory Oversight, Information Sharing and Post-transplant Drug Choice

Ph.D. Dissertation Defense

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Thursday, May 3, 2018, 12:20 PM

Junkins Board room, 210

Abstract:

The United States and many other nations are encountering a disturbing obstacle: A shortage of available organs for patients who are in need of kidney transplantation. This dissertation strives to analyze this trend and present potential solutions by focusing on three different aspects, namely

regulatory oversight, information sharing, and post-transplant immunosuppressant drug choice. This dissertation presents three research studies related to kidney transplantation.

The first research study proposes a stochastic model that identifies a socially optimal kidney transplant choice given the inherent trade-off between the expected wait time (driven by supply and demand) and the quality of the received donor kidney. The proposed model accounts for changes made by the introduction of performance assessment and the new kidney allocation system in 2017 and 2014, respectively. An empirical analysis indicates that the current risk-adjusted post-transplant performance assessment policy might be more effective if regulators also adjust the policy based on the differences in organ availability by regions and candidate's blood type.

Motivated by the high kidney discard rate in the US, the second research study develops a simulation and optimization models that considers the effect of several important factors that affect kidney utilization. Unlike most proposed models, the presented simulation reflects details of the offering process, the deterioration of patient health and kidney quality over time, and the probability of kidney acceptance. I apply the model to perform two different analyses. The former considers the individual-level strategy of simultaneously enlisting in multiple regions. The latter focuses on a macro-level aspect of transplantation, namely the contribution of information sharing on the social welfare and discard rates.

Long-term successful post-transplant outcome necessitates the use of immunosuppressant drug therapy to prevent immunologic rejection and maintain transplanted kidney function. Since kidney transplantation is primarily financed through public funds in the U.S. (Medicare), the third research study defines, from the payer's perspective, the incremental cost-effectiveness among four different treatment regimens, i.e., no-induction, IL2-RA, r-ATG, and alemtuzumab.

Bio:

Zahra Gharibi received her B.Sc. in Mathematics from Sharif University of Technology in 2005. She got her M.Sc. in Operations Research from Southern Methodist University in 2012. She is currently pursuing her Ph.D. program at Southern Methodist University. She received the 2017 research day award from the Office of Research and Graduate Studies, SMU.

Everyone invited and welcome!