جلسه ارائه علمی دانشکده مهندسی صنایع

An Optimal Incentive Alignment for a National Kidney Exchange Program

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Abstract

End-stage renal disease (ESRD), the complete or partial failure of both kidneys, is the ninth-leading cause of death in the United States. Over a half million patients suffer from ESRD in the United States, and their annual medical expenses exceed forty billion dollars. Although dialysis is available, transplantation is the preferred treatment for ESRD. Unfortunately, there is a severe shortage of transplantable kidneys, with many patients currently on the waiting list. This shortage is exacerbated by the inherent difficulty in finding compatible kidneys.

Kidney exchange is a growing approach to alleviate the shortage of kidneys for transplantation. Several local kidney exchange programs have been initiated in the United States; however a national kidney exchange program would produce more and better transplants. A major challenge to establish a national kidney exchange program is the lack of incentives for hospitals to participate in such a program. To overcome this issue, the kidney transplant community has recently proposed a payment strategy framework that incentivizes hospitals to participate in a national program. As more kidney transplants reduce dialysis expenses, it may be possible to design financial incentives that are a "win-win" for the government and transplant centers. What is absent from this debate is a careful investigation of how to design these incentives.

We develop a mixed-integer bilinear bilevel program to find an equilibrium payment strategy. We show that this bilevel program can be solved as an equivalent mixed-integer linear program. We calibrate our model using a data set provided by the United Network for Organ Sharing, which leads to data-driven insights about advantages of a national kidney exchange program. We shed light on several controversial policy questions about an equilibrium payment strategy. In particular, we demonstrate that with proper incentive policies, a national kidney exchange program could result in saving thousands of lives and billions of dollars annually.

Biography

Amin Dehghanian has received his PhD from the Department of Industrial Engineering at the University of Pittsburgh. He received his BS and MS in industrial engineering from Sharif University of Technology. His primary research interests include applied and methodological operations research. In particular, he has been active in healthcare operations, computational game theory, integer programming, and queueing theory.