

**Program in Industrial & Systems Engineering
IE 8773-8774
Title: A Broader View of Designing the Liver Allocation System
By**

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**Wednesday, Sept 30, 2009
3:15 PM – Refreshments before the seminar
3:30 PM – Graduate Seminar**

Room 4125 A & B Mechanical Engineering

Abstract

We consider the problem of designing an efficient liver allocation system for allocating donated organs to patients waiting for transplantation, the only viable treatment for end-stage liver disease. Given the scarcity of available organs relative to the number of patients waiting for transplantation, we model the system as a multiclass fluid model of overloaded queues, which captures the disease evolution by allowing the patients to switch between classes over time, e.g. patients waiting for transplantation may get sicker/better, or may die. We characterize the optimal solution to the fluid model using the duality framework for optimal control problems developed by Rockafellar (1970). We consider two different metrics to measure efficiency. On the one hand, under the objective of minimizing total number of patient deaths while waiting for a transplant, the current United Network for Organ Sharing System (UNOS) policy emerges as the optimal policy for our formulation, providing a theoretical justification for the current practice. On the other hand, under the metric of maximizing quality-adjusted life years (QALY), the optimal policy is an intuitive dynamic index policy, where the indices depend on patients' acceptance probabilities of the organ offers, post-transplant QALY, and the shadow prices calculated from the dual dynamical system. This optimal policy advocates comparing each patient's marginal benefit from transplantation, i.e. the difference between the benefit with transplantation and the benefit without transplantation, and offering an available organ to the patient who has the highest marginal benefit. Finally, we perform a detailed simulation study to demonstrate the effectiveness of the proposed policies using clinical databases and data from UNOS.

Joint work with: M. Akan, O. Alagoz, F.S. Erenay, A. Said

Bio

Baris Ata is an associate professor of operations management at Kellogg School of Management, Northwestern University, where he has been since 2003. He received a B.S. in industrial engineering (1997) from Bilkent University, Ankara, Turkey, and an M.S. in EES and OR (1999), business research (2000), mathematics (2001), and statistics (2002), and a Ph.D. in business administration (2003) from Stanford University, Stanford, CA. His research areas are: dynamic control of manufacturing, service, and communication systems; revenue management; health-care management; and sustainable operations. He is the founding director of the

Operations Management Ph.D. Program at Kellogg; and currently serves an associate editor for Management Science and M&SOM, and as an area editor for SORMS (Surveys in ORMS).