

Arizona State University
Fulton School of Engineering
Department of Industrial Engineering
FALL 05-SPRING 06 SEMINAR SERIES

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Departments of Industrial Engineering and Medicine
University of Pittsburgh, Pittsburgh, PA

Title: Modeling the Patient's Perspective on Liver Acceptance
Date: November 23, 2005 (Wed)
Time: 11:00 am
Place: Goldwater Center GWC 510

Abstract:

For end-stage liver diseases (ESLD), such as primary biliary cirrhosis and hepatitis B, transplantation is the only available therapy. Unfortunately, there is a serious shortage of livers available for transplant; over 2,000 patients die annually due to a lack of livers. In this talk, I discuss three decisions that various ESLD patients must make in the course of waiting for a liver for transplantation. I formulate each of these decisions as a Markov decision process (MDP), and describe structural properties of the models, as well as computational results calibrated on clinical data.

Living donors are a growing source of livers for transplantation. In the last 10 years they have increased from negligible levels to the source for 10% of all liver transplants. There are several medical advantages to using living donors. One is that the liver is always available, so that the time to transplant may be chosen. Perhaps surprisingly, the optimal time to transplant the liver is not always right away; it is often optimal to "use up" the current liver before receiving the living-donor liver. The main structural result is a set of sufficient conditions for the existence of a control-limit policy.

Most patients rely on cadaveric donors, for which they are placed on a waiting list. Priority is based on a number of factors, including geography, clinical factors such as blood type and laboratory values, and waiting time. Periodically, a patient may be offered a cadaveric liver, and must decide whether or not to accept it. The patient can reject the liver without penalty and wait for a better organ later, or accept the organ. For this model, there are two classes of control-limit policies: liver-based and health-based. I describe sufficient conditions for the existence of both types of control-limit policies.

The most general model considers a patient who has an available living donor, but all things being equal would prefer to use a cadaveric liver. The goal is to maximize the life expectancy of the patient plus that of the donor. The main structural result is sufficient conditions for the existence of an at-most-three-region policy for this problem.

I conclude the talk by discussing future extensions of this research, including more accurate models of the waiting list, as well as a multiple listing problem. I then briefly discuss my other interests in medical decision making, such as HIV drug scheduling, designing the organ donation hierarchy, and strategies for in-vitro fertilization.

Bio:

Andrew Schaefer is an Assistant Professor in the Department of Industrial Engineering at the University of Pittsburgh, where he is Wellington C. Carl Faculty Fellow. He holds secondary appointments in the Departments of Medicine and Bioengineering. His primary research interests are in therapeutic optimization, stochastic programming, and supply chain management.

For further information about the seminar series, or to be added to the seminar announcement e-mail list, please contact Dr. Esma Gel <esma.gel@asu.edu>.