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New computer models successfully link donors and kidney transplant patients

Boston College economist examines the 'matching market' of kidney transplant

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CHESTNUT HILL, MA (March 11, 2009) – New computer models can now link strangers in a life-saving chain of kidney transplants, promising to increase the number of transplants and overcome obstacles posed by logistics or donors who renege, a team of researchers report in the current edition of the *New England Journal of Medicine*.

Designed to optimize the "matching market" principles involved in kidney transplantation, donor registry software programs sift through thousands of pairs of recipients and their living donors, analyze participant characteristics, then construct an optimal chain of transplant pairs, report the co-authors, many of whom helped pioneer the creation of donor chains.

For the approximately 70,000 U.S. patients in need of a kidney transplant, the data-driven approach to transplantation pairings should shrink the rolls of patients on waiting lists.

The donor chains start with a single "altruistic" volunteer donor.

"The Good Samaritan who comes forward to donate a kidney serves as the catalyst for a series of donations in a much more efficient system," says Boston College Assoc. Prof. M. Utku Unver, a theoretical economist. "It is not an easy decision to give up a kidney to help a stranger. These advances may encourage more donors because they now know they can save many lives."

The approximately 4,000 living donor kidney transplantations that take place in America each year rest upon a fragile balance of donors and recipients engaged in a "matching market" where volunteers provide life-saving organs without monetary compensation, says Unver, who has been examining kidney exchange for five years.

The computer-generated chains provide a viable alternative to the relatively new strategy of paired donation, where organs are exchanged between two donor-recipient pairs during simultaneous surgeries.

Paired donations are prone to breakdowns because a willing donor is not a compatible match, a recipient is too far away or a donor backs out of the extremely personal transaction.

Unver and his fellow researchers highlight a chain of kidney transplantations that started with a 28-year-old Michigan man in July of 2007 and led to 10 transplantations coordinated during 8 months by two large paired-donation registries, the 25-state Alliance for Paired Donation and Incompatible Kidney Transplantation Program at Johns Hopkins Hospital.

The transplantations took place at six medical centers in five states. Three kidneys from living donors were shipped – two using commercial flights – rather than requiring donors to travel to the recipient's hospital.

The computer models assign values to the characteristics of donors and recipients stored in massive databases. The programs then generate pairings based on with similar scores, imposing an order on these exchanges by overcoming issues that disrupt a market

"Economists have been looking at solving the 'mechanism design' problem of paired donations by using data to increase efficiency," says Unver, whose early work on these models with fellow BC economist Tayfun Sonmez led to the founding of the New England Program for Kidney Exchange. "As work progressed, people began to see this was a way of overcoming the problems involved with paired donations."

Paired kidney donation surgeries are performed simultaneously to reduce the possibility of a donor backing out once a friend or relative has received a kidney.

A donation chain allows for greater flexibility, since not all surgeries must take place at the same time in the same hospital.

The researchers conclude further that kidney donor chains could shorten wait times on lists of unmatched patients in line for deceased-donor organs. The scope of the databases can pair these patients with suitable living donors, who account for approximately one-third of the 14,000 kidney transplantations that take place annually in the U.S.

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Unver was joined by co-authors Michael A. Rees, M.D., Jonathan E. Kopke, Ronald P. Pelletier, M.D., Dorry L. Segev, M.D., Matthew E. Rutter, M.D., Alfredo J. Fabrega, M.D., Jeffrey Rogers, M.D., Oleh G. Pankewycz, M.D., Janet Hiller, Alvin E. Roth, Tuomas Sandholm, and Robert A. Montgomery, M.D.

For more information about Prof. Unver's work, please see his website at: http://fmwww.bc.edu/ec/unver.php.

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