Global Kidney Exchange

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Patients receiving renal replacement therapy (dialysis) in 2010 (estimate)

Kidneys Transplanted per million population

(U.S.A., Argentina, Uruguay, Brazil, Chile, Philippines, Nigeria)

(Global Observatory on Donation & Transplantation)
In the U.S., 100,000 people are on the deceased donor waiting list, but we only have 12,000 deceased donor transplants per year.

Elsewhere, 2-7 million people die every year worldwide due to inability to pay for either dialysis or kidney transplantation.
Papers


• “Financing Transplant Costs of the Poor: Global Kidney Exchange,” Afshin Nikzad, Mohammad Akbarpour, Michael Rees, and Alvin E. Roth, working paper, 2016
Kidney exchange—U.S. background

- Many more people need kidney transplants than there are available organs.
- The waiting list in the US has about 100,000 people
  - The wait can be years, and many die while waiting (4,448 in 2015, with another 4,377 removed from waiting list as “too sick to transplant”).
  - In 2015 we had 12,250 transplants from deceased donors
- Transplantable organs can also come from living donors.
  - In 2015 we had 5,628 transplants from living donors
- Sometimes donors are incompatible with their intended recipient.
- This opens the possibility of exchange.
Simple two-pair kidney exchange

Donor 1
Blood type A

Recipient 1
Blood type B

Donor 2
Blood type B

Recipient 2
Blood type A
Notice that no money changes hands…

• Kidney exchange is an “in kind” exchange

• Section 301, National Organ Transplant Act (NOTA), 42 U.S.C. 274e 1984: “it shall be unlawful for any person to knowingly acquire, receive or otherwise transfer any human organ for valuable consideration for use in human transplantation”.
Charlie W. Norwood Living Organ Donation Act

Public Law 110-144, 110th Congress, 2007

- Section 301 of the National Organ Transplant Act (42 U.S.C. 274e) is amended-- (1) in subsection (a), by adding at the end the following: "The preceding sentence does not apply with respect to human organ paired donation."
2-way exchange involves 4 simultaneous surgeries
Chains initiated by non-directed (altruistic) donors

Non-directed donation before kidney exchange was introduced

Wait list

Non-directed donor
Chains initiated by non-directed (altruistic) donors

Non-directed donation before kidney exchange was introduced

Non-directed donation after kidney exchange was introduced
A Nonsimultaneous, Extended, Altruistic-Donor Chain


SUMMARY

We report a chain of 10 kidney transplantations, initiated in July 2007 by a single altruistic donor (i.e., a donor without a designated recipient) and coordinated over a period of 8 months by two large paired-donation registries. These transplantations involved six transplantation centers in five states. In the case of five of the transplantations, the donors and their coregistered recipients underwent surgery simultaneously. In the other five cases, “bridge donors” continued the chain as many as 5 months after the coregistered recipients in their own pairs had received transplants. This report of a chain of paired kidney donations, in which the transplantations were not necessarily performed simultaneously, illustrates the potential of this strategy.
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<td>Recipient's State:</td>
<td>AZ</td>
<td>OH</td>
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<td>OH</td>
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<td>Recipient's Sex and ABO type:</td>
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<td>O</td>
<td>A</td>
<td>A</td>
<td>B</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>A</td>
</tr>
<tr>
<td>Donor's Sex and ABO type:</td>
<td>O</td>
<td>O</td>
<td>A</td>
<td>A</td>
<td>B</td>
<td>A</td>
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<td>Recipient's PRA:</td>
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<td>0%</td>
<td>23%</td>
<td>0%</td>
<td>82%</td>
<td>78%</td>
<td>64%</td>
<td>3%</td>
<td>100%</td>
<td>46%</td>
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<tr>
<td>Recipient's Ethnicity:</td>
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<td>Cauc</td>
<td>Cauc</td>
<td>Cauc</td>
<td>Hispanic</td>
<td>Cauc</td>
<td>Cauc</td>
<td>Hispanic</td>
<td>Cauc</td>
<td>AA</td>
</tr>
<tr>
<td>Recipient-to-Donor Relationship:</td>
<td>Wife Husband</td>
<td>Daughter Mother</td>
<td>Mother Daughter</td>
<td>Brother Sister</td>
<td>Husband Wife</td>
<td>Daughter Father</td>
<td>Wife Husband</td>
<td>Friend</td>
<td>Brother</td>
<td>Mother Daughter</td>
</tr>
</tbody>
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1 The initiating donor was an unpaired altruistic donor from Michigan.
2 The recipient of Transplant 6 required desensitization to HLA DSA by T and B cell flow cytometry.
3 The recipient of Transplant 9 required desensitization to blood group (AHG titer of 1:8).
KPD and NDD Transplants in U.S.
• Wednesday, August 3, 2016  First kidney exchange in Nepal
• March 7, 2016  First paired kidney exchange transplant done in Singapore
• Friday, July 24, 2015  Kidney exchange in Turkey (1st exchanges there)
• April 10, 2015  A first non-directed donor kidney exchange chain in Italy
• March 30, 2015  A first kidney exchange in Argentina at Fundacion Favaloro
• March 5, 2015  First kidney exchange in Poland
• Friday, November 7, 2014  Kidney exchange in Spain: now more than 100 transplants
• June 7, 2014  Kidney exchange in France
• December 19, 2013  Kidney exchange in Vienna
• August 19, 2013  Ten kidney exchange transplants on World Kidney Day in Ahmedabad, India
• July 28, 2013  First Kidney Exchange in Portugal:
• July 23, 2013  Kidney exchange chain in India
• June 6, 2013  Kidney exchange between Jewish and Arab families in Israel
• December 26, 2012  Kidney exchange in Canada
• December 1, 2012  Kidney exchange in India
• June 1, 2012  Mike Rees and Greece: an intercontinental kidney exchange
• March 27, 2012  Kidney exchange in Britain
• February 5, 2012  Kidney exchange in Australia, 2011
• April 29, 2011  First kidney exchange in Spain
• December 8, 2010  National kidney exchange in Canada
• August 3, 2010  Kidney Exchange in South Korea
• Friday, July 30, 2010  Kidney transplantation advice from the Netherlands

Kidney exchange outside the U.S.

• March 9, 2010  Kidney exchange from Britain (1st 3-way there)
• January 27, 2010  The Australian paired Kidney eXchange (AKX) goes live
• June 25, 2009  Kidney exchange in Canada (1st exchange there)
• February 27, 2009  Kidney Exchange in Australia (in Western Australia)
Global kidney exchange: a possibility of mutual aid

United States

Transplants unavailable

Two-way exchange
First global kidney exchange, with a pair from the Philippines—January 2015, Alliance for Paired Donation (Rees et al.)

Jose Mamaril received a kidney from a non-directed American donor in Georgia. His wife, Kristine, donated one of her kidneys to an American recipient in Minnesota, whose donor continued the chain by donating to a patient in Seattle.

THE BLADE/JETTA FRASER
The chain to date
Safely home...

• $50,000 escrow fund for post-surgical care
Global Kidney Exchange

The GKE proposal is “self-financing”.

• Back of the envelope calculation:
  • cost of hemodialysis ≈ $90,000 per year
  • average time under dialysis ≈ 5 years
  • cost of transplant ≈ $120,000 per surgery (plus $20,000 in maintenance therapy costs per patient per year)

• But in steady state, waiting time decreases. So dialysis costs will go down...how long will GKE remain self financing?
GKE remains self financing even when it becomes widespread.

Intuition:

• Some domestic pairs immediately find a match
• Some other do not find a match upon arrival.
  • They increase the average waiting cost
• International pairs get matched to those the latter type of domestic pairs
• So even if the average dialysis cost is less than the surgery costs, GKE can still be self-financing because it matches domestic patients with higher-than-average dialysis costs.
The medical logistics may not be the hard part
Financial flows

• Savings:
  • Medicare—complex legislative/bureaucratic
  • Private insurers (33 months)

• Costs:
  • Surgeries—transplant centers
  • Post surgical treatment in home countries
  • Infrastructure development in home countries

• USAID?--Same Federal budget, but no change needed in Medicare

• Allow insurance companies to nominate patients?
Repugnance constraints

• Living donors
  • From poor countries

• As a first reaction, many people are going to conflate global kidney exchange with buying kidneys (which is illegal everywhere except Iran—a ‘repugnant transaction’)

Repugnance

• 1. “the plan is really not about the international recipient (nor...about the international donor), but only about getting organs for US citizens. So it is exploitative."

• 2. “Lets solve problems at home first...We should encourage programs that allow Americans to help Americans."

• 3. “There is an exploitation of a social condition (being destitute in a foreign country) that kidney transplantation should not be the remedy of resolving social inequities."
• Repugnance Concerns:
  • Inadequate post-surgical care
  • Escrow funds for immunosuppressive drugs and post surgical care (in Philippines)
  • Basic infrastructure (in Nigeria)—USAID?
  • Inappropriate/illegal/unethical donor solicitation (how can we ensure that foreign donors aren’t selling their kidney?)
  • Family requirement?
  • For non-directed donors too?