

# Who should travel in kidney exchange programs: the donor, or the organ?

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**T**HERE IS AN INCREASING GAP WORLDWIDE BETWEEN the demand for and supply of kidneys for transplantation, and the situation in Canada is no exception.<sup>1</sup> In most North American and European countries, the number of deceased-donor kidneys available for transplant is insufficient to meet the need. Among the measures that have been implemented to alleviate this shortage are (1) widening the eligibility criteria for deceased-donor organs; (2) procuring organs after cardiac death; (3) expanding the pool of living donors to include altruistic donors; and (4) developing exchange programs for incompatible donor/recipient pairs. This fourth scenario (the focus of this article) pertains to cases in which a prospective living donor proves not to be a match for the intended recipient. Two such pairs can be “linked” when Donor 1 cannot donate to Recipient 1, but can donate to Recipient 2, and Donor 2 cannot donate to Recipient 2, but can donate to Recipient 1. Variations on this exchange include “domino” or chain exchanges involving more than two donor/recipient pairs.<sup>2</sup>

Interest in this type of living-donor organ donation is growing, and some researchers have estimated that such exchanges could result in 1000 to 2000 additional renal transplants being performed annually in the United

States.<sup>3</sup> In Canada, there were no exchange programs before 2009, when Canadian Blood Services launched the Living Donor Paired Exchange Registry.<sup>4</sup> Initially, 3 provinces were involved (Alberta, British Columbia and Ontario), and now all provinces are part of the exchange program. Quebec was the last province to join, in November 2010. The first domino exchange in Canada took place in June 2009.<sup>4</sup> In the first 18 months of the program, 107 pairs were registered and 65 transplants were proposed (as of August 2010, 39 of the proposed transplants had been completed, 9 were under review and 17 had been cancelled) (Dr. Peter Nickerson, Executive Medical Director (Transplantation) Organ and Tissue Division, Canadian Blood Services; personal communication, 2010). To date, donors participating in the pilot project have travelled to recipients' respective transplant centres. We might question, however, whether in a country such as Canada we should be “shipping” the donor, or the kidney. It could be argued that this question is irrelevant, and that paired-exchange programs should be regionalized (e.g., at the provincial level) to maintain efficiency and reduce the burden of travel for donors. However, considering that, to function properly, exchange programs are estimated to require a population of over 15 million (to have sufficient potential donors), and that increasing the pool of pairs significantly increases the chances of finding a compatible donor for hard-to-match recipients, provincial or regional programs might not be the best option.<sup>5</sup>

## Arguments for donor travel

Traditionally, most exchange programs have involved the donor travelling to the recipient's transplant centre to reduce the cold ischemia time—one of the reasons invoked for the better long-term outcomes of living-donor as compared with deceased-donor renal transplantation. However, two recent case reports from the United States on domino kidney transplantation that involved shipping organs via a commercial airline or private jet showed good renal transplant function despite the longer cold ischemia time (between 8 and 14 hours).<sup>6,7</sup> It is important to note that one of the recipients of a shipped kidney had a high titer of preformed anti-HLA antibodies, which made her a difficult match and at higher risk of acute rejection.

A retrospective study conducted by Simpkins and colleagues found excellent outcomes of living-donor kidney transplantation with cold ischemia times of up to 8 hours.<sup>8</sup> The authors concluded that the transport of organs from living donors is feasible if the cold ischemia

time is limited to 8 hours.<sup>8</sup> However, it is important to bear in mind that 85% of living-donor kidneys had less than 2 hours of cold ischemia time, and that data on transplant outcomes for cold ischemia times of more than 8 hours are limited. A large retrospective study<sup>7</sup> using the United Network for Organ Sharing Kidney Transplant Registry compared medical outcomes of renal allograft from healthy deceased donors (average cold ischemia time of 18.3 hours), and from living organ donors (average cold ischemia time of 2.4 hours), and found similar rates of graft survival at 3 years in both groups (85.7% v. 87.8%). The authors concluded that cold ischemia time did not significantly influence medical outcomes, and thus supported the shipment of kidneys.<sup>9</sup> Further studies are nonetheless needed to investigate the impact of cold ischemia times (especially of more than 8 hours) on living-donor kidney transplantation.

Another argument in favour of shipping the donor instead of the kidney is that the team involved in procurement is also the transplanting team, which could make the procedure more efficient. In the case of deceased-donor organ donation, however, kidneys are not necessarily procured by the same team conducting the transplant; this does not seem to be problematic, since the technique for deceased-donor organ donation is standardized. Finally, an important argument in favour of shipping the donor is a logistical one. Given the six time zones within Canada, it is quite likely that some transplant surgeries would occur outside normal working hours, in order to minimize cold ischemia time; having the donor on site would eliminate this concern.

### Arguments for shipping the kidney

There are some important advantages in shipping the kidney instead of the donor. First, because the two incompatible pairs are likely to be in different hospitals, it is easier to maintain the anonymity this affords by shipping the organs. A study conducted in the Netherlands showed that anonymity was an essential condition for the participation of potential incompatible pairs in exchange programs.<sup>10</sup> Second, shipping the kidney to the recipient's transplant centre allows the donor to remain in a familiar setting, surrounded by family and friends, thus receiving the support that is essential throughout the donation and transplantation process.<sup>11</sup>

Now that Quebec has joined the Living Donor Paired Exchange Registry, language will also become an issue: 79% of the Quebec population speak French, whereas English is the predominant language in the rest of Canada.<sup>12</sup> If a unilingual francophone donor were to travel

to a recipient's transplant centre outside Quebec, he or she might not be able to receive care in French, which would potentially compromise the quality of the transplantation experience. Similar situations are imaginable in, for example, the United States (e.g., with regard to Spanish speakers) or in European countries, where there are significant linguistic minorities, especially among first-generation immigrants. However, there is no literature describing the impact of linguistic factors on transplantation outcomes.

One cannot underestimate the importance of the trust relationship established between the donor and transplant professionals during the living-organ donor assessment. Deciding to donate an organ to a stranger—even if the end result is an available organ for a loved one—is still an emotionally and psychologically difficult decision for many people, and one that requires a supportive clinical environment. This does not mean that other transplant centres will not offer professional and supportive care. But, when one considers that a transplantation team will be responsible for the long-term follow-up care of living organ donors, there is even more reason for the latter to remain with a medical team they know and trust.

### Conclusion

The first domino exchanges in Canada involved the donor travelling to the recipient's transplant centre; to date, there have been no reports of adverse events or dissatisfaction resulting from this arrangement. These results are similar to those reported in the Netherlands, the United States and South Korea, the three countries that have had the most experience with exchange programs. That being said, these countries do not have the same linguistic characteristics as Canada, and two of the three are geographically much smaller, which makes the shipping of organs easier and the cold ischemia time shorter.

An important and potentially determinative factor in paired-exchange programs is the travel and associated costs of the two alternatives (i.e., shipping the kidney, or the donor). Currently, no Canadian data are available to enable cost comparisons. Such an analysis would also have to take into account variations among provincial reimbursement programs for living donors' travel and living expenses. Some provinces currently reimburse donors' for their travel expenses; others do not. Now that Canadian Blood Services has launched a national exchange program, a detailed cost analysis will be essential to the development of rational, equitable policies.

It is probably more advantageous for living organ donors to stay in a transplant centre and be cared for by a team they know and trust, and to be close to their loved one/recipient, family and friends. However, it is not unreasonable to assume that some potential living organ donors will be willing to travel to another province with the aim of reducing cold ischemia time and maximizing transplantation outcomes (even though conclusive evidence on the impact of cold ischemia times on the outcomes of living renal transplantation is still lacking). Thus, although we favour transporting the organ rather than the donor, both options should still be offered to potential living organ donors participating in exchange programs.

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