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Banking on Living Kidney Donors—A New Way to Facilitate Donation without Compromising on Ethical Values

DOMINIQUE E. MARTIN*
Deakin University, Geelong, Victoria, Australia

GABRIEL M. DANOVITCH
University of California, Los Angeles, Los Angeles, California, USA

*Address correspondence to: Dominique E. Martin, PhD, School of Medicine, Deakin University, Geelong Waurn Ponds Campus, Locked Bag 20000, Geelong, VIC 3220, Australia. E-mail: dominique.martin@deakin.edu.au

Public surveys conducted in many countries report widespread willingness of individuals to donate a kidney while alive to a family member or close friend, yet thousands suffer and many die each year while waiting for a kidney transplant. Advocates of financial incentive programs or "regulated markets" in kidneys present the problem of the kidney shortage as one of insufficient public motivation to donate, arguing that incentives will increase the number of donors. Others believe the solutions lie—at least in part—in facilitating so-called "altruistic donation;" harnessing the willingness of relatives and friends to donate by addressing the many barriers which serve as disincentives to living donation. Strategies designed to minimize financial barriers to donation and the use of paired kidney exchange programs are increasingly enabling donation, and now, an innovative program designed to address what has been termed "chronologically incompatible donation" is being piloted at the University of California, Los Angeles, and elsewhere in the United States. In this program, a person whose kidney is not currently required for transplantation in a specific recipient may instead donate to the paired exchange program; in return, a commitment is made to the specified recipient that priority access for a living-donor transplant in a paired exchange program will be offered when or if the need arises in the future. We address here potential ethical concerns related to this form of organ "banking" from living donors, and argue that it offers significant benefits without undermining the well-established ethical principles and values currently underpinning living donation programs.

Keywords: *advanced donation, ethics, kidney transplant, living donation*

I. INTRODUCTION

In 2015, approximately 40% of kidney transplants worldwide were made possible by living donors (Matesanz, 2016). In some regions, living donors provided the majority of kidneys for transplantation, reflecting the absence of effective deceased donation programs, whereas in the European Union, the United States, and Australia, living donors enabled 20 to 30% of total kidney transplants (Matesanz, 2016, 16–17). Expansion of living donation along with deceased donation remains an important goal in countries seeking to meet their needs for kidney transplants, despite emerging concerns about the relative long-term risks of living kidney donation, even among carefully selected donors with lifelong access to healthcare services (Mjøen et al., 2014). In countries such as the United States and Australia, rates of living donation appear to have stagnated or declined (Rodrigue, Schold, and Mandelbrot, 2013; ANZDATA, 2016). Some commentators argue this reflects a problem of insufficient motivation on the part of potential donors, which might be addressed by offering financial incentives in the form of regulated kidney markets (Fisher et al., 2015). However, others contend that various barriers to living donation impede or discourage donation, despite sufficient motivation (Martin and White, 2015). Recent efforts to increase living donation have thus sought to harness existing motivation by addressing barriers such as the financial costs or disincentives associated with donation (Hays et al., 2016), lack of awareness and education about donation opportunities (Waterman et al., 2015), and immunological incompatibilities between willing donors and their intended recipients (Ferrari et al., 2015).

In 2016, a new pilot program of a form of "advanced donation" was introduced at the University of California, Los Angeles (UCLA) (Veale et al., 2017). This program effectively seeks to address a previously neglected barrier to living donation: chronological incompatibility between donors and recipients.

Chronologically incompatible kidney donors are individuals who, at the present time t_p, are:

- medically and psychosocially eligible to donate a kidney;
- willing to donate to a designated individual (i.e., "directed donation");
- *unable to proceed* with donation at t_p because the designated recipient does not require a transplant at that time; and
- unlikely to be able to donate at a future time t_f, when a designated recipient may require a transplant, as a result of ageing, expected mortality, or future life events limiting availability for donation such as work, travel, or pregnancy.

The concept of advanced donation at least partially addresses the issue of missed opportunities for donation by chronologically incompatible donors, by enabling non-directed donation at t_p to an unrelated transplant recipient while preserving the donor's opportunity to help a designated individual receive a kidney transplant at a future time t_f. In doing so, the donor may be seen as donating "in advance" to a designated individual, who thus benefits even though currently a transplant is not indicated.

The novel program of advanced donation introduced by UCLA could greatly increase living donation by providing greater flexibility and increased opportunities for donation. However, it also presents several potential ethical concerns. In this paper we discuss the most important of these concerns, consider strategies that may mitigate ethical risks, and identify ways in which current models of advanced donation might be modified to more effectively address barriers faced by chronologically incompatible donors and other potential living donors. We will argue that advanced donation programs have the potential to transform living kidney donation from a largely private, individualized, altruistic practice to a public philanthropic enterprise grounded in solidarity and reciprocity, which nevertheless protects individual interests in prioritizing the transplant needs of specific, designated individuals.

II. CURRENT MODELS OF ADVANCED LIVING KIDNEY DONATION

Kidney paired exchange programs address the issue of immunological incompatibilities (because of blood type and/or tissue typing) between prospective donors and their intended recipients by enabling kidney "swaps" between one or more donor–recipient pairs (Ferrari et al., 2015). Typically, such swaps occur simultaneously, or near simultaneously, in a domino-like manner when "chains" of pairs are formed (ibid.). Chains can be initiated by a non-directed altruistic donor, willing to donate without a reciprocal transplant for a designated individual. When it is not possible to "close the loop" in a series of exchanges, such that a potential donor remains for whom a reciprocal recipient is not found within the group of pairs, the last donor either donates to an individual on the deceased donor waiting list who does not have a donor of his or her own, or acts as a "bridge" donor by initiating another chain at a later date. In 2013, the United States National Kidney Registry introduced a form of advanced donation whereby donors could donate at a time most convenient for them, t_p, even if their paired recipient (the person they designate to benefit from their donation) "has not yet been matched with a suitable donor or scheduled for surgery" (Flechner et al., 2015). Such donation differs from the chronologically incompatible donation defined above, because the designated recipients *do* require a transplant at time t_p. To distinguish them from chronologically incompatible donors, we term them "delayed paired exchange donors," because the transplantation of the intended beneficiary may be delayed, but could well

be contemporaneous. The National Kidney Registry (2016) describes this practice as "short term" advanced donation.

In the National Kidney Registry program, the delayed paired exchange donor donates at t_p to the kidney paired exchange program, with donations used to facilitate chains of paired donation, thus increasing the number of transplants able to be performed. In order to benefit from a transplant made possible through a series of paired exchanges, a potential recipient must usually provide a donor who contributes to the chain. When a chain is initiated or sustained as the result of a non-directed donation, the number of donors exceeds the number of recipients, with the result that one or more transplants will be available for recipients who do not have a paired donor. Those individuals are described as "closing out" or "concluding" the chain, because when they receive their kidney, there is no paired donor to continue the process. The delayed paired exchange donor's intended beneficiary is allocated to receive the first available kidney that would conclude a paired donation chain. Of ten pairs who participated in this program over 3 years from August 2011, eight intended beneficiaries received a transplant between 2 weeks and 19 months after their paired donor's donation. Of the two individuals who remain untransplanted, one declined an early transplant offer for personal reasons and has remained inactive (not seeking a transplant) since then; the other has not yet received a transplant offer through the paired exchange program due to difficulties in matching (Flechner et al., 2015).

In 2016, the first transplant from a chronologically incompatible kidney donor took place at UCLA through a novel advanced donation program (Veale et al., 2017; Rivero, 2016). Sixty-four year-old Howard Broadman's grandson Quinn had a chronic kidney disease expected to progress to end stage renal failure. Broadman was willing and eligible to donate a kidney to his grandson; however, by the time Quinn required a transplant, Broadman might no longer be eligible to donate, or alive to do so. Together with transplant professionals at UCLA, a model of advanced donation was designed to address this chronological incompatibility between Broadman as donor and Quinn as intended beneficiary of Broadman's donation. In this model, an individual can make a non-directed donation at t_p to the paired exchange program, thereby facilitating several transplants, in return for a "voucher" which designates a specific beneficiary. That beneficiary, like those in the delayed paired exchange donor program described above, is entitled to priority in closing out a future paired exchange chain, thus ensuring that he will receive a transplant from a living donor if he remains a suitable transplant candidate at t_f. Under the auspices of the National Kidney Registry, which distinguishes these "voucher cases" from "short term" cases of advanced donation, the program is now expanding with transplants performed from chronologically incompatible donors in Los Angeles and New York (Veale et al., 2017), and several transplant centers in the US now participating in the voucher program (National Kidney Registry, 2017).

At present, advanced donation by chronologically incompatible donors is only available through the National Kidney Registry's "voucher program" and involves several restrictions. At the time of consenting to participate in the program, donors may designate a maximum of five potential beneficiaries or "intended recipients," each of whom "must be a kidney transplant recipient or currently have, or be expected to have, some form of renal function impairment" (National Kidney Registry, 2016) (e.g., a family with autosomal dominant polycystic disease or other inherited kidney disease). Additional beneficiaries cannot be added later, and vouchers cannot be withdrawn, are non-transferable, and expire on the death of the intended recipient. There is no prioritization of beneficiaries when more than one is designated, with the first to require transplantation benefiting from the voucher. Potential recipients may receive vouchers from up to five donors, potentially enabling them to receive several transplants if necessary.

III. POTENTIAL ETHICAL CONCERNS ABOUT ADVANCED DONATION FOR CHRONOLOGICALLY INCOMPATIBLE DONORS

Four conditions are commonly identifiable in the literature discussing the ethical acceptability of non-therapeutic nephrectomy for the purpose of living kidney donation: (i) the donor should make an autonomous decision to donate, following careful evaluation of the risks and benefits of the procedure; (ii) the risks to the donor should fall below a maximum threshold which is ill-defined but often implicit in clinical debate regarding donation; (iii) the donated kidney should be suitable for transplantation in a recipient for whom it is expected to confer sufficient benefits to justify the risks assumed by donor and recipient in undergoing these procedures; (iv) the donation should be necessary, in the absence of therapeutically comparable alternatives for the intended recipient (Woodruff, 1964; Ethics Committee of the Transplantation Society, 2004; Reese, Boudville, and Garg, 2015; Spital, 2001, 2004; World Health Organization, 2010).

In directed living donation, wherein the recipient is related, biologically or emotionally, in some degree to the donor, the donor's assumption of risks may be partially justified on the grounds that improving the recipient's health will also benefit the donor (Allen, Abt, and Reese, 2014; Spital, 2004). Benefits for the donor include not only the pleasure or pride of satisfying a desire to help the recipient, but potentially improved quality of family life, socioeconomic benefits that may result from recipients returning to work, and the likelihood of recipients living longer (Clemens et al., 2006). In non-directed (often called "altruistic" or "Good Samaritan") donation, there is no relationship between the donor and the recipient who is unknown to the donor at the time of the donation, and may remain so afterwards. Despite the absence of some of the benefits associated with related donation, and hence

concern on the part of some clinicians that the balance of risks and benefits, or quality of decision-making, for non-directed donors may be inferior to that of related donors, non-directed donation is increasingly considered ethically justifiable and permitted, if not encouraged, in many countries (Spital, 2000; Dew, Boneysteele, and DiMartini, 2014; Henderson et al., 2003).

Advanced donation for chronologically incompatible donors may complicate some of the longstanding ethical foundations of related living donation, because there is far greater uncertainty concerning the benefits which may accrue in time to the donor's intended beneficiary. Donors and voucher recipients are informed that "there is no guarantee that the patient can be matched and transplanted" (National Kidney Registry, 2016): in other words, if the primary motivation of the donor is to help ensure that the beneficiary receives a transplant at time t_f, it is conceivable this desire may be unsatisfied. It will be some years before sufficient data are available to provide estimates of the impact of an advanced donation on the probability of an intended beneficiary benefiting from the paired donation program, and the chances of an individual benefiting will be influenced by several factors, including the relative difficulty of finding a suitably matched donor (Hawryluk, 2016). It is also conceivable that some intended beneficiaries may not, after all, require or be suitable candidates for transplantation in the future. The chronologically incompatible donor makes a decision to donate at t_p, based on the information available at that time, in the expectation or hope of achieving particular outcomes at t_f. If the donors were instead to make a decision at t_f, or even closer to that time, the information available, and hence the decision, might be different. The quality of consent from chronologically incompatible donors may thus be questioned. Of note, post-decisional regret might occur if either the expectations of benefit to voucher recipients are not fulfilled, or conceivably, if an unexpected need for transplantation arises from another known recipient during the window of opportunity for living donation that would have prevailed if advanced donation had not occurred. Finally, if the chronologically incompatible donor overestimates the potential impact of advanced donation on the intended beneficiary's future transplant status, it is possible that the hopes of helping a loved one in the future are being unfairly exploited for the benefit of the broader community for whom advanced donation enables an increase in transplants through paired exchange chains.

Fortunately, these concerns may be readily addressed. First, rigorous consent processes should help to ensure that donors are fully informed of the uncertainties concerning potential benefits to the voucher recipient(s). Although consent practices are not always consistently implemented, achieving valid consent is feasible (Kortram et al., 2014). To avoid premature decision-making, professionals involved should identify a reasonable window of opportunity for advanced donation for each potential chronologically incompatible donor. For example, a grandparent in her 50s may

be able to defer advanced donation for several years, enabling her to make a more informed decision based on the progression of a grandchild's kidney disease, the arrival of other grandchildren, etc. In addition, because advanced donation for chronologically incompatible donors necessarily occurs at a time when the intended beneficiary does not require a transplant, the potential psychosocial pressures that may influence consent to living related donation may be greatly reduced, if not absent. Studies suggest that related donors may be more likely to feel under pressure to donate than non-directed donors (Valapour et al., 2011; Henderson et al., 2003). Cooling off periods are used in some living donation programs to enhance the consent process by providing prospective donors with more time to reflect on their decision (Rodrigue et al., 2007). Advanced donation is likely to provide an extended "cooling off" period, with no immediate need for transplantation on the part of the intended beneficiary(s). Thus, a person who consents to advanced donation is potentially more likely to be making a rational and voluntary decision than one confronted with a loved one's immediate need for transplantation.

Furthermore, although advanced donation does not guarantee a transplant for the intended beneficiary at t_f, it increases the chance of such a transplant. In contrast, assuming that the assessment of chronological incompatibility between the donor and intended beneficiary is correct, if advanced donation does not occur at t_p, then the donor will not be in a position to donate at t_f, and will be unable to influence the chances of the beneficiary receiving a transplant at all. In other words, while the personal benefit may not be as great as the chronologically incompatible donor hopes for in making an advanced donation, a benefit is nevertheless accrued. Advanced donation provides an opportunity to help that would not otherwise exist.

Nevertheless, current restrictions in the advanced donation program may be perceived as unjustifiably limiting the ability of chronologically incompatible donors to exercise their autonomy by unnecessarily constraining their future set of choices with regard to use of the voucher, and thereby potentially resulting in harm in the form of post-donation regret. Experience of regret related to past decisions is not uncommon in human lives, particularly when decision-makers reflect with the benefit of hindsight and believe they would have chosen differently if they had known the implications of their choice for the future. In the context of living donation, it should be taken seriously not only due to the negative psychological impact it may have on donors, but also because by identifying choices which are more likely to result in future regret, contemporary decision-makers may make better choices, meaning those which are more likely to reflect their sustained and authentic values, beliefs, and preferences, assuming that regret is more likely to be associated with errors in decision-making. We therefore consider potential improvements which might be made to the current program in order to reduce the risk of post-donation regret.

IV. POTENTIAL IMPROVEMENTS ON CURRENT MODELS OF ADVANCED DONATION

Should Vouchers be Non-transferable?

Making particular autonomous choices often results in a reduction in future options or opportunities for choice that a person would, ideally, prefer to have available, but which a person foregoes when necessary to achieve their immediate goal(s). For example, when a contemporaneous donor chooses a specific recipient for that kidney, this eliminates the option to choose to donate a kidney to someone in the future, but serves to fulfill the goal of helping a person in immediate need of a transplant. Similarly, the chronologically incompatible donor is currently required to choose specific recipients of the voucher, making a binding decision regarding the beneficiaries at t_p, which eliminates the option of gifting a kidney or voucher to someone else in the future but fulfills the immediate goals of donating and preserving the opportunity to help a loved one through future use of the voucher.

However, for some chronologically incompatible donors, their voucher-related goals might, ideally, encompass the ability to make an autonomous decision regarding the beneficiary of the voucher at a future time, in accordance with their personal preferences and informed by circumstances which may have changed since t_p. At a future time, the voucher recipients designated at t_p may not need to use the voucher, and several potential beneficiaries may exist to whom the donor would prefer to give the voucher. If a loved one develops an unanticipated need for a transplant during the lifetime of the donor and before any of the intended voucher beneficiaries develops such a need, the donor will be denied the opportunity to give the voucher to the person who might benefit the most from it, or whom the donor might prefer to help in those circumstances.

The chronologically incompatible donor effectively provides an insurance policy for the voucher beneficiaries, for the event that a transplant is required. This event may be expected, but is not certain. For example, the intended beneficiary may receive a transplant from another related living donor at t_f, rendering the voucher unnecessary, at least for the duration of adequate function of that transplant. Unlike an insurance policy, the vouchers cannot be updated with new beneficiaries as the donor's life circumstances evolve. The preservation of opportunities for future choice is standard practice when counseling patients, and is usually limited only by the constraints of feasibility. For example, patients are encouraged to review important decisions made in advance about treatment options and permitted to revoke consent or change their preferences. Similarly, advance planning in other areas allows competent decision-makers to exercise their autonomy as new options become available, or new circumstances alter individual preferences regarding the choices available. Potential non-directed donors may be deterred from donation due to the desire to preserve the opportunity

for directed donation in the future if a loved one develops a need for transplantation. Given the natural partiality of many individuals to prioritize the needs of loved ones over strangers, those who do make a non-directed donation are thus at risk of suffering future regret: believing that they would have chosen differently, that is, not to make a non-directed donation, if they had known that a loved one would develop a need for transplantation. Chronologically incompatible donors may be doubly affected by regret if the potential benefit of their earlier donation is still to some extent preserved and available to some loved ones through the voucher program but non-transferable to the loved one in immediate need.

The requirement to designate beneficiaries of non-transferable vouchers aims to obviate the potential for commodification of vouchers. Recipients might otherwise, for example, transfer them to another transplant candidate in return for payment or other material benefit, thus effectively violating laws prohibiting trade in organs and failing to respect the wishes of the donor. However, surely during the lifetime of the donor they could be permitted to designate or change a beneficiary at any time, subject to formal review of the voucher transfer? In order to minimize the risk of a commercial transaction or coercion of the donor, the same processes used to evaluate the relationship and motivations of contemporaneous donor–recipient pairs could be used to evaluate voucher donors and beneficiaries. Removing the condition of non-transferability or advanced and irreversible designation of voucher beneficiaries would enhance the benefits of advanced donation for donors by preserving the opportunity for them to make an informed and specific choice regarding the use of the voucher during their lifetime, as their personal circumstances evolve.

Similarly, after the death of the donor, or if the donor becomes incapable of autonomous decision-making, and if the voucher(s) have not been used, designated beneficiaries might be entitled to transfer the voucher to a person of their choice. For example, if my mother designates me as a beneficiary of her donated kidney and then dies, and I am on dialysis and eligible to use the voucher, but my nephew then requires a transplant and no other living donor is available, I might wish to donate my voucher to him. Again, the processes used to evaluate donor–recipient pairs could be applied. Transferability would enable donors to "ensure" that ultimately someone in their family or community would benefit from their donation, according a level of private control and respect for the partiality often inherent in donation, while enabling a gift that also benefits the public by making a non-directed living-donor kidney available to the paired exchange system. If potential donors avoid donation for fear of missing a future opportunity to help a loved one, their kidneys may eventually be "wasted."

The postponement or avoidance of non-directed donation in order to retain a potential donor's "spare" kidney for future use in the event that a designated beneficiary requires it for transplantation could be described as a

form of private kidney banking. However, kidneys in potential living donors cannot be "banked" indefinitely, but only for the period of the potential donor's lifetime in which they would be a medically suitable donor. In contrast, by making a donation to the public—represented by the population of candidates awaiting deceased donor kidneys for transplantation—through the advanced program, and obtaining a voucher for designated beneficiaries, the private benefit of the kidney donation can be preserved indefinitely until it is required, thus providing a legacy that may extend for generations if the voucher remains unused.

Should Advanced Donation be Available to Other Potential Living Donors?

It becomes clear that another key limitation of the current model is the requirement to designate beneficiaries who have, or are "expected to have, some form of renal function impairment" (National Kidney Registry, 2016). Even if the vouchers were made transferable, if they could only be given to or transferred between individuals meeting this criterion, there is a risk the vouchers could expire before use. If this criterion were removed, advanced donation could also be used to address a potential barrier to non-directed kidney donation, that of the aforementioned opportunity cost whereby a non-directed donor at t_p removes the possibility of helping a loved one to obtain a needed transplant at t_f.

Cautious non-directed kidney donors are individuals who at time t_p are:

- medically and psychosocially eligible to donate a kidney;
- willing to make a non-directed donation to an unknown individual; and
- *unwilling to proceed* with donation at t_p due to the fear that at some time in the future t_f they may wish to make a directed donation to a known individual requiring transplantation but would be unable to do so as a result of making an earlier non-directed donation.

The number of potential cautious donors is unknown. While several studies of public attitudes towards living donation report that many people express willingness, in principle, to donate a kidney to a stranger (Tong et al., 2013), and studies of actual non-directed donors have identified several factors which may motivate donation (Henderson et al., 2003; Massey et al., 2010; Rodrigue et al., 2011; Maple et al., 2014), we are aware of only one study at the time of writing which has investigated reasons that may deter individuals from acting on their willingness to make a non-directed donation. In interviews with 31 non-directed donors, Maghen et al. (2017, 698) identified four core themes of fear and concern to donors before donation: financial costs; quality of life and health outcomes; unease relating to meeting recipients; and "the potential for either the participant or a loved one to need a kidney transplant in the future after the donation." Anecdotal reports also suggest that the opportunity costs of non-directed donation may negatively

influence potential donors, and may be seen as a concern equivalent to or even greater than concerns about the risks of living donation itself on the donor. For example, a Reddit thread responding to the story of a non-directed living donor included several comments such as the following:

> I've been thinking of doing this since I saw it on Reddit. But I'm not sure and I'm kinda scared. I'm still young, I have a multitude of years yet to live. What happens if someone around me needs a kidney and I already donated one? I think I [would] feel almost guilty having already donated one and not being able to possibly save my loved one's life. What if there are complications? What if I actually damage [my] remaining kidney in the future? (WiggleBooks, 2014)

Cautious non-directed donors may postpone donation in case a relative or friend develops a need for transplantation, but like chronologically incompatible donors, the opportunity for donation will eventually disappear. Advanced donation, with a transferable voucher or one that could be designated to an unspecified relative at least, would enable those who wish to donate for the benefit of a stranger to do so without fear of later suffering regret for the lost opportunity to help a loved one. Satel (2016) refers to potential vouchers of this sort as "peace-of-mind vouchers." It is likely that many such donors would never need to offer their vouchers to a loved one, and thus could instead gift it, for example, to future generations, or even gift it to a stranger through the paired exchange program, enabling them to help more than one candidate for transplantation.

A further group of potential living donors may also benefit from advanced donation. Some patients in need of kidney transplants are fortunate to have multiple healthy and motivated potential donors available to them. A study at one US transplant center found that 39% of transplant candidates with potential living kidney donors had more than one potential donor (Lapasia et al., 2011). While nearly half of the potential donors in this study were excluded during the evaluation process on medical criteria, it is possible that 20% of transplant candidates presenting with potential living donors will have more than one eligible donor. Currently, the "unused" or unrequired potential donors typically do not complete their pre-donation evaluation and are turned away and never donate.

Unrequired potential kidney donors are individuals who, at the present time t_p, are:

- medically and psychosocially eligible to donate a kidney;
- willing to donate to a designated individual;
- *not asked to proceed* with donation at t_p because the designated recipient receives a transplant from another living donor or a deceased donor at that time; and
- unlikely to be able to donate at a future time t_f, when a designated recipient may require a transplant, as a result of advancing age or future life events.

These individuals may become chronologically incompatible or cautious non-directed donors. They may wish to preserve the opportunity to help the individual who receives a transplant from another donor at t_p, in the event that person requires a second transplant in the future, or may be motivated to make a non-directed donation but cautious about doing so in case the beneficiary later requires a second transplant. Although the strength of motivation to donate to the designated recipient at t_p is likely to outweigh any motivation to act as a non-directed donor, such unrequired donors are nevertheless likely to be more willing to donate to unrelated individuals than those never exposed to the donation option, because they have demonstrated a willingness to present for evaluation as a donor. Empirical research in this field is lacking; however, reports of non-directed donors indicate that some have a history of a missed opportunity to proceed with a directed donation (Marozzi, 2015; Praderio, 2016).

Advanced donation for unrequired donors has the capacity to tap an important pool of potential donors whose willingness to donate was frustrated by the fact that another living donor was chosen or their donation became unnecessary. Their donated kidneys could provide vouchers for the initial recipient for the event that the first or second transplant failed. If the recipient is fortunate to benefit from prolonged function of the first living-donor transplant, the donors become, de facto, non-directed donors that can start new paired exchange chains or provide kidneys for recipients on the deceased donation waiting list that do not have living donors of their own. The extent of this untapped donor resource may be considerable, although the number of prospective donors who are declined and "lost" due to the selection of another living donor is not currently known. Although the US study cited above found that 39% of transplant candidates had more than one potential donor (Lapasia et al., 2011), this may not reflect the wider prevalence of multiple potential donors. Potential donors may not always seek evaluation unless the first potential donor who presents is rejected, and the evaluation of many potential donors ceases once an individual is chosen, usually on the grounds of being the best immunological match. Research is needed to quantify this potential and determine how many eligible but unrequired donors might be willing to make a non-directed donation if a voucher were available.

Could the Value of Vouchers be Enhanced?

Because one of the concerns about the program is that the benefit of vouchers to recipients is not guaranteed, in the form of a transplant occurring through the paired exchange program, is it possible to increase the likelihood of a voucher recipient receiving a transplant? For example, could a voucher alternatively be used to award a degree of priority to the recipient in the allocation of deceased donor kidneys? While a transplant from a living donor is often preferable, if this is not possible in a timely manner,

for example, due to incompatibility issues with available donors, then a deceased donor transplant may well be beneficial.

In Israel, to encourage deceased donation, the prior authorization to be an organ donor in the event of sudden death provides a benefit to first-degree relatives in the form of a degree of priority for transplantation from the deceased donor pool (Lavee et al., 2010). If a non-directed, advanced kidney donor were to receive a transferable voucher according the beneficiary a degree of priority on the transplant waiting list, or priority to close a paired exchange chain, this may increase the chance of the advanced donor's intended beneficiary obtaining a future transplant. Enhancing the value of the voucher would help to address concerns about fairness in the advanced donation program, and encourage more advanced donations. Of note, living donors already receive a degree of priority for their own benefit in allocation of organs from deceased donation programs in countries such as the United States, Israel, and parts of Europe (Potluri et al., 2015; Eurotransplant, 2016, 22; Lavee et al., 2010). This addresses one of the potential barriers to living donation—the relatively increased risk that they themselves could develop a need for transplantation.

V. RECONCEIVING LIVING DONATION AS A SOLIDARITY-BASED PROGRAM OF KIDNEY BANKING

Advanced donation could offer individuals more opportunities to donate a kidney, with greater freedom in choosing when to donate and to which beneficiaries of this donation, and could greatly enhance the benefits of an individual kidney donation to the broader community in need of transplantation. Advanced donation does so because it may facilitate a more efficient system of banking in kidneys from living donors.

Despite the discordance between the commercial terminology and the altruistic nature of organ donation, the term "banking" has long been applied to deceased donation. Like banks for other medical products of human origin, such as blood and plasma products, deceased donation organ banks are necessary to ensure the timely availability—wherever possible—of scarce but essential health resources that have limited storage lives, particularly in the case of solid organs, and which require careful matching between products and recipients. In some countries, those who indicate their willingness to invest in organ banks by registering as a deceased donor may derive some personal benefit through prioritization in the event they require organ transplantation (Lavee et al., 2010). In general, however, those who make a deposit to the bank through donation of organs after death will not personally reap the rewards of their investment. Although in rare circumstances an organ from a deceased donor may be directed to an individual known to the donor (Aita, 2011; OPTN, 2017; NHMRC, 2016), the intended beneficiaries of deceased donation investments are usually unspecified fellow members of

society. The current limitations of organ preservation technology mean that long-term storage of one's organs after death in the hope of making these available to designated beneficiaries at a future time of need is unfeasible. Deceased donation organ banking is thus inherently solidarity-based—individuals make contributions to a public pool of resources for the benefit of all.

The Disadvantages of Privately Banking Kidneys from Living Donors

The notion of a bank in organs from living donors has been mooted only in the context of markets in kidneys aiming at facilitation of private exchanges for individual benefit rather than helping to meet collective needs for transplantation. In this context, individuals may be seen as each possessing a private, personal bank of organs, some of which can be "cashed in" or used as collateral against debts where the opportunity to sell a kidney or part of a liver exists, or which can be stolen and traded by human traffickers (Rothman and Rothman, 2006; Scheper-Hughes, 2003; Columb, 2016). In the non-commercial sense, individuals also might be regarded as "banking" some organs for the period of their lives in which they would be medically eligible to donate. For example, the term "surplus" is sometimes applied to an individual's second kidney in discussions about living donation, with the understanding that for many people, one of their two kidneys could be removed for use in transplantation, just as one might withdraw an item previously placed in a bank or other storage for safekeeping. Such "surplus" organs privately "banked" in living individuals generally have a longer storage life than organs obtained from a deceased donor, meaning that I could choose to donate one of my kidneys at age 30, or wait thirty more years to do so. However, they cannot be stored indefinitely, which means that if one wishes to donate, but defers doing so beyond a certain time, that opportunity may be lost and the "surplus" is effectively wasted. There is little point in removing a kidney for the purpose of transplantation if a suitable recipient is not available. Thus, when banked privately by an individual, the value of this investment is dependent on the existence of a "sweet spot" in time, at which the individual is eligible to donate, and an intended beneficiary of the donation—in the form of a suitable transplant recipient—is eligible to receive the kidney.

Private banking in living-donor kidneys is thus a haphazard enterprise with avoidable inefficiencies, which limit the ability of individuals to personally benefit from their "surplus" kidney by helping designated individuals to receive transplants. By its nature, such private banking limits the availability of transplants from living kidney donors, with many potential donors missing opportunities and kidneys thus going to waste.

Advanced Donation Would Facilitate Public Banking of Kidneys Obtained through Living Donation

Although a degree of partiality—the preference to prioritize needs of known individuals over strangers—may be present in deceased donation (in some

allocation algorithms the next-of-kin of deceased donors may designate specific individuals, but not groups of individuals, to be the organ recipients [Aita, 2011; OPTN, 2017; NHMRC, 2016]), partiality is currently much stronger in living donation where there is a clear difference in levels of hypothetical willingness to donate to a loved one versus a stranger (Gordon et al., 2015). Evidence suggests that many living donors would be willing to participate in paired exchange programs, even in the absence of incompatibilities between donors and their intended recipients (so-called "compatible pairs") (Hendren et al., 2015); however, the allocation of kidneys obtained through living donation is primarily determined by the relationships between individual donors and their intended recipients. That is, if person A is eligible to receive a kidney donated by his friend person B, then B's kidney will go to A, even if an exchange between the pair AB and a series of other pairs could have resulted in more transplants through the paired exchange program, and/or enabled more timely transplantation or utility gains from grafts through matching of donors and recipients according to medical criteria. The distribution of kidneys from living donors is currently determined primarily by the partiality of donors for specific transplant candidates, rather than impartial decision-making aimed at maximizing the therapeutic benefits of donations for all transplant candidates. If the influence of donor partiality on the system were reduced, for example by ensuring that the living donors' intended beneficiaries received a transplant but distributing the kidneys as needed to optimize matching and utility gains, living donation programs might have an even greater impact on transplant outcomes for more people. Currently, private interests compete with public interests in a system that primarily facilitates private exchanges.

In contrast, advanced donation enables public banking of kidneys obtained through living donation by providing opportunities for donation to the common pool of organs for distribution among the public for the benefit of all, while preserving the opportunity for donors to benefit a designated individual at a later time. The kidney donated to the common pool is effectively exchanged for a voucher with similar, if not quite equivalent value in the form of a kidney provided through the paired exchange program or potentially through deceased donation. Advanced donation reduces many of the elements of risk currently associated with the decision to proceed with non-directed donation (thereby losing a kidney for future directed use), and with the decision not to proceed with non-directed donation (thereby preserving a kidney that may never be used). By enabling and encouraging living donation at the optimal time for donor's health (i.e., when old enough to enable accurate evaluation of lifetime risks of donation) and enabling objective matching of kidneys obtained through living donation with recipients without the influence of partiality between related donor–recipient pairs, an allocation system for kidneys from living donors could also be created that would optimize transplant outcomes, reduce risks for living donors, and improve equity, all while reducing the problem of kidney supply.

Research is needed to better evaluate the extent to which fear of losing opportunities for directed donation undermines willingness to participate in non-directed donation, and whether the opportunity to obtain a voucher for the future benefit of designated individuals would encourage non-directed donation. Even if chronologically incompatible, cautious non-directed and unrequired kidney donors comprise only a small proportion of the population of potential living donors, and uptake of advanced donation converts only a small proportion of this population to actual donors, the shortage of kidneys for transplantation could become a thing of the past. Not only would the number of "new" willing donors increase, by participating in advanced donation and thus enabling kidneys to be allocated to maximize utility gains and opportunities for transplant through paired exchange programs, these donors would also facilitate more transplants and potentially improve transplant outcomes.

Potential Concerns about the Reframing of Living Donation as a Public Enterprise

Unlike most public banks of organs from deceased donors, wherein the principle of reciprocity has little influence on organ allocation, access to a public bank of kidneys from living donors would necessarily be prioritized for those who have been designated as beneficiaries of the "investors"—living donors. However, the current system of living donation is well established as one in which the majority of individuals benefits only when someone contributes to the pool of available kidneys for transplantation on their behalf, according them the right to dip into this supply. By enabling more non-directed living donation, advanced donation would likely enable more people to benefit who may otherwise lack a potential living donor, without negatively impacting those who do.

As noted earlier, the quality of donor and recipient relationships has historically served to justify the assumption of risks on the part of the living donor. There may therefore be a concern that a public bank of kidneys from living donors could alter the emotional mechanics associated with normative living donation. There might be reduced intimacy in the donor–recipient relationship, because more recipients would be unrelated to their donors. On the one hand, this could be beneficial, as recipients may be subject to less pressure to meet a donor's expectations, and both recipients and donors may be less at risk of feeling a failure if the transplant fails or a donor suffers harm (Watson et al., 2013). On the other hand, advanced donation could increase pressure on relatives to donate by making it more difficult to provide a convincing alibi for not donating. However, advanced donation would give potential donors more time—"breathing space"—to make a considered decision without the pressure of a relative in immediate need of transplantation.

It could be claimed that by encouraging and facilitating advanced donation, particularly when there is little likelihood of vouchers being required for use by recipients known to the donor, we are unduly encouraging a risky behavior for the broader benefit of society. This is important to acknowledge, given growing concerns about lifetime risks of living donation. However, we do permit people to assume that risk, if they make an informed choice for the benefit of a known or unknown contemporaneous recipient. To deny those who can only make that choice if advanced donation is available seems unfair, especially given that in advanced donation the quality of decision-making may be more autonomous, albeit less well informed with regard to specific benefits to a voucher beneficiary. Also, as already discussed, the more participation we have in advanced donation and a public system of allocation of living-donor kidneys, the more we may be able to reduce risks in living donation by choosing optimal times for donation, etc. This would be especially the case with cautious non-directed donors. The ideal period for advanced donation in these cases might be, for example, 45–65 years old when individuals are likely to know if they have children or parents in need, and when they would be suitable donors to those people at that age, and able to evaluate their own lifetime risk most accurately.

VI. IS ADVANCED DONATION A STEP TOWARDS A MARKET IN KIDNEYS FROM LIVING DONORS?

Some commentators have seized on news of the advanced donation voucher program as a sign of progress towards acceptance of financial incentives for living donation (Satel, 2016). Headlines, for example, coupled "vouchers" with "incentives," apparently seeking to leverage enthusiasm for the innovation of advanced donation to increase support for payments that have also been described as "innovative." It is therefore important to determine whether there is any aspect of the current program, or the modified program we have sketched here, which might be interpreted in this way; otherwise, our claims that advanced donation will enable living-donor kidney banking grounded in both partial altruism and impartial solidarity would be fundamentally flawed. However, attempted analogy between the vouchers of advanced donation programs and financial incentives for donation is misplaced.

Although the term "gift voucher" is perhaps now synonymous with fungible items bearing a specific monetary value, the vouchers offered through advanced donation programs are not fungible and have no monetary value. The vouchers offer a benefit to the recipient in the form of an increased chance of receiving a living-donor kidney for use in transplantation. This benefit is directly derived from a person who provides such a kidney; it is not exchanged for monetary gain in any form.

The advanced donation vouchers have been described as representing an "incentive" for donation. An incentive usually consists of an added benefit not normally anticipated to result from action *X*, which serves to motivate an individual to choose to perform that action in the absence of sufficient reason to do so. Offering an advanced donation voucher to those who agree to make a non-directed donation provides a benefit that is not inherent to such donation. A grandmother who has no desire to make a non-directed donation might be motivated to donate if offered $50,000. Alternatively, she might be motivated by the chance to obtain a voucher which could be of value in the future to her grandson. The magnitude of the latter incentive will likely increase if her grandson is diabetic and at a higher risk of developing kidney failure in the future. However, in many cases the voucher program is more likely to function by removing a disincentive to donation, rather than by providing an incentive, by addressing the potential opportunity cost of non-directed donation which removes the option to make a directed donation in the future. As advanced donation programs expand, and research is undertaken to investigate reasons that might deter people from acting on their expressed willingness to make non-directed donations, it will be easier to evaluate the extent to which vouchers may act as incentives.

When paired exchange programs were first introduced, concerns were expressed that the exchange of kidneys between unrelated pairs might represent "bargaining" or exchange of a kidney for "valuable consideration"—in the form of another kidney—thus technically violating laws on trade, which have used such vague terminology. Despite this legal complexity being now well addressed (Tenenbaum, 2016) and the evidence that when kidneys are donated in return for a reciprocal kidney donation there is no "material", that is, financial or fungible gain on the part of donors, the fact that advanced donation and the program of public banking of living donor kidneys we have proposed facilitate a less intimate exchange of kidneys might be interpreted as a "step" towards marketization in the sense of commercial trade in kidneys. Krawiec, Liu, and Melcher (2016), for example, describe kidney exchange as a "matching market." While academics working in the field may recognize that market systems of exchange are not necessarily synonymous with commercial trade, the technical nuances of terms commonly associated with commerce—whether market or voucher—could negatively influence perceptions and understanding of an advanced donation program and public bank in kidneys from living donors. Although studies suggest some people are in favor of payment for organs, attitudinal surveys often employ terms such as compensation, reward, or incentive, rather than explicit market terminology (e.g., Gordon et al., 2015). In a review of such studies, for example, Hoeyer, Schicktanz, and Deleuran (2013) suggest that donation programs promoting fairness and reciprocity may be more effective than financial incentives in encouraging donation.

Care must therefore be taken not only in public promotion of advance donation programs, but also in academic discourse on this topic. The corruption and confusion of terms such as compensation, for example, which is now widely used in the academic literature to refer to payments representing a financial gain and hence incentive for living donation, have likely undermined efforts to promote financial neutrality in organ donation, wherein financial costs are covered or reimbursed in accordance with the law, for fear of violating the prohibition on trade in organs. Advanced donation taps into existing altruistic motivations to donate a kidney, removing barriers to donation, rather than offering any financial advantage to donors that would risk exploiting the vulnerable and promoting inequity in donation and transplantation.

VII. CONCLUSION

By facilitating living donation, advanced donation follows the example set in deceased donation programs, wherein greater participation is for the benefit of all. In contrast, traditional, contemporaneous, related living donation, while allowing for an ethically justifiable partiality in allocation of organs, nevertheless may limit our capacity and collective efforts to meet needs for transplantation. Although advanced donation and voucher programs will require careful and ongoing review as they evolve, and further work is needed to address ethical concerns relating to autonomy in donation decision-making, equity in allocation of kidneys, and the potential for commercial exploitation of vouchers, these early models have the potential to usher in a new era in organ donation and transplantation.

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