To wait or not to wait: Preference heterogeneity in kidney transplantation

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Kidney transplantation offers several advantages compared to dialysis treatment for patients with end-stage renal disease (ESRD) in terms of long-term mortality risk, improved survival advantages and quality of life (Salvioli et al., 2016). Nevertheless, the disparity between a large number of transplant patients and the scarcity of organs available continues to increase (Courtney & Maxwell, 2009); forcing patients to long waiting time, and stimulating transplant physicians to push the limits of donor suitability to utilise organs from donors with characteristics different from the "ideal" situation (so-called Expanded Criteria Donors (ECD)). In this setting, the selection criteria for donor appropriateness have been widened significantly in recent years, including older persons and those with co-morbidities such as hypertension, diabetes, suboptimal renal function, or risky behaviours which may potentially increase the risk of infectious disease transmission.

An increasing number of transplants are now performed by expanding the pool of donors including those who would have been considered unsuitable before. The ECD program implemented since 2002 in the USA and the Eurotransplant Seniors Program (ESP) implemented since 1999 in Europe are two examples of such policies. For instance, ECD or "marginal" kidneys, while inferior to standard criteria donor (SCD) kidneys, may prolong the life of the recipient compared to dialysis[1] treatment. Apart from survival advantage, an economic analysis also suggested that transplantation with a marginal donor kidney is more cost-effective than dialysis treatment.

With the latest presumption, many transplant centres refuse to utilise kidney from marginal donors; therefore, a significant number of kidneys are currently discarded. Unfortunately, there are no reliable and unambiguous means to define the outcome of transplantation for an organ. Several aspects related both to the donor quality and the recipient clinical conditions may affect the functional recovery, as well as the length of the cold ischemia time, defined as the interval between the procurement of the organ and its reperfusion during the recipient operation. Because kidneys start to degrade during this cold ischemic time, surgeons typically hope to transplant them within 24 hours. It has been claimed that organs discarded could be transplanted if the system for allocating them better matched the right organ to the proper recipient in the right amount of time. Sometimes, kidneys are discarded because the allocation process has required a too long time, for example when an organ is offered to several centres who refuse it (either the physicians or the patients) so that finally it becomes unsuitable.

Kidney recipients have a very important frontline role in defining how organs are allocated, and yet their preferences have been largely ignored in kidney allocation algorithms. Dialysis treatment could be a reasonable option against which patients on the waiting list can balance risks and benefits. As a result, different patients may have different preferences regarding the proposed treatment, i.e. regarding quality and waiting time. They may prefer to wait for either a long time with the prospect of receiving an ``ideal" kidney or accept an organ of inferior quality with the advantage of short waiting time.

Patients are informed regarding the risk factors of the donor they will receive the organ from, but at the time of entering the waiting list, they hardly have the chance to express their

[1] Dialysis is the process whereby blood is cycled out of the body and filtered through a machine, which removes waste and excess fluids.

preferences towards the quality of organs they are willing to accept. The decision depends solely on medical/immunological compatibility, and it is made somewhat "automatic" by the allocation algorithm with limited involvement from the patients. One of the reasons why allocation algorithms do not account for patients' preferences is that pinning down preferences in a consistent way within the pool of transplant patients is not an easy task. Patients are unlikely to have the possibility to choose the medical treatment they have to go through; therefore, it is not possible to infer their preferences from actual choices.

We employed a stated preference (SP) experiment to overcome this problem. In SP experiments, patients are presented with choices sets, each of which contains two or more transplant alternatives that vary with respect to attribute levels. For each choice task, they are expected to face trade-offs between attributes and based on these trade-offs, they state what alternative they would choose. Analysis of responses relies on the assumption that individual service attributes (e.g., cost, effectiveness, side effects, etc.) determine patients' choices. This assumption allows willingness to wait (WTW)[2] measures to be derived. The experiment included four kidney transplantation dimensions (attributes): two quantitative time attributes (waiting time and expected graft survival), and two qualitative risk attributes (infectious risk and neoplastic risk). An example of a choice task asks patients to choose between Transplant A (Survival: 15 years, Infectious risk: High, Neoplastic risk: Low, Waiting time: 36 months) and Transplant B (Survival: 20 years, Infectious risk: High, Neoplastic risk: Low, Waiting time: 60 months). 16 choice tasks were presented to each patient.

This is the first to investigate patients' preferences for the time and risk attributes of kidney transplantation and examine trade-offs for these attributes based on a willingness to wait (WTW) approach. We elicit preferences of the entire population of patients enrolled on the waiting list for a transplant at the largest transplant centre in Italy, the Pancreas and Kidney Transplant Unit of the School of Medicine of the University of Padova. A significant WTW heterogeneity is observed for all the characteristics of the kidney in the experiment and that the WTW depends on patients' observable characteristics, namely age and duration of dialysis. Younger patients are willing to wait longer compared to older patients for a better kidney, and patients with longer duration of dialysis are willing to wait longer for a better organ. Assigning expanded criteria donor organs to older patients would increase the number of transplants and reduce the number of wasted organs. The implication for transplant practice is that including patient preferences' in kidney allocation protocols that assign "non-ideal" (expanded donor criteria or marginal) organs may not only increase the expected survival rates of patients with transplanted organs but also improve patients' satisfaction.

However, the above results should be understood in light of the following points. When eliciting stated preferences for the characteristics of kidney transplantation, patients are assumed to evaluate each attribute separately without constraints. One problem with stated preference experiment is that patients are asked to answer repeated choice tasks, and hence the possibility of making arbitrary choices (e.g., flip a coin) is common-possibly due to limited information processing capacities. In this regard, I investigated the effect of patients' numeracy skill on the consistency of their responses to repeated choice tasks. I find that patients with a higher numeracy skill are more likely to make a consistent choice decision.

[2] How many (more) months, on average, patients are willing to wait for extra level of an attribute (year of graft survival, a reduction from augmented (higher) down to standard (lower) infectious/neoplastic risk)?

Therefore, if the goal of an experiment is to use willingness to wait estimates for welfare analysis, accounting for the consistency of responses may be useful.

Last, in such experiments, patients may adopt alternative decision rules to decrease the cognitive difficulty of the choice task. For instance, patients could aggregate attributes before making a choice decision, which has an important implication for welfare analysis.

References

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