TSANZ
The Transplantation Society of Australia and New Zealand

Communication

Implementation of a maximum KDPI value for paediatric donors

Summary

On May 28, 2024, a change will be introduced in OrganMatch whereby kidney donors aged less than 18 years will receive a maximum Kidney Donor Profile Index (KDPI) value of 20. This is in response to a recognised issue with the accuracy of the KDPI score in paediatric donors, such that KDPI values calculated for donors less than 18 years may overestimate the risk of graft failure associated with kidneys transplanted from these donors.

Background

The Kidney Donor Risk Index (KDRI) was proposed by Rao et al. in 2009.[1] Various studies have subsequently validated the KDRI's capacity to predict kidney graft survival, including in the Australian population.[2] The Kidney Donor Profile Index (KDPI) translates the relative risk scale of the KDRI to a cumulative percentage scale.[3] However, the KDPI was derived using a cohort of adult kidney donors and is therefore less accurate for predicting paediatric kidney graft survival, as it over-estimates the risk from smaller-sized donors with otherwise well-functioning kidneys.[4,5]

The KDPI score used in Australia is a simplified version of the Rao KDPI that uses fewer parameters but retains the same coefficients. It therefore has the same limitations with respect to predicting outcomes in paediatric recipients and over-estimates the risk of graft failure, especially in donors under 10 years (see Figure 1).

The current Australian kidney allocation system incorporates the KDPI via the "prognosis matching" restriction applied in the state-level allocation algorithm. The intention of this criterion is to promote the allocation of high-quality kidneys to recipients with a long expected post-transplant survival (EPTS). Specifically, kidneys are preferentially offered to recipients where the difference between KDPI and EPTS scores is 50 points or less. However, the high values that the KDPI formula yields for young donors may limit paediatric recipient access to potentially suitable kidneys from paediatric donors, by directing these kidneys towards recipients with a higher EPTS.[4,6,7]

[1] Rao PS, Schaubel DE, Guidinger MK, Andreoni KA, Wolfe RA, Merion RM, Port FK, Sung RS (2009) A comprehensive risk quantification score for deceased donor kidneys: the Kidney Donor Risk Index. Transplantation 88:231–236
[2] Clayton PA, McDonald SP, Snyder JJ, Salkowski N, Chadban SJ (2014) External validation of the estimated posttransplant survival score for allocation of deceased donor kidneys in the United States. Am J Transplant 14:1922–1926
[3] Zhong Y, Schaubel DE, Kalbfleisch JD, Ashby VB, Rao PS, Sung RS (2019) Reevaluation of the Kidney Donor Risk Index. Transplantation 10:1714–1721
[4] Jackson KR, Zhou S, Ruck J, Massie AB, Holscher C, Kernodle A, et al. Pediatric deceased donor kidney transplant outcomes under the kidney allocation system. Am J Transplant (2019) 19(11):3079–86.
[5] Montgomery A et al. A modified kidney donor risk index for pediatric kidney transplant recipients. Pediatric Nephrology, 2022
[6] Parker WF, Thistlethwaite JR, Ross LF (2016) Kidney donor pro- file index does not accurately predict the graft survival of pediatric deceased donor kidneys. Transplantation 100:2471–2478
[7] Nazarian SM, Peng AW, Duggirala B, Bittermann T, Amaral S, Levine MH (2018) The kidney allocation system does not appro- priately stratify risk of pediatric donor kidneys: Implications for pediatric recipients. Am J Transplant 18:574–579

No suitable alternative formula currently exists that would offer a more accurate means of assigning a prognosis score to paediatric donors. Two US studies have attempted to develop an alternative score;[5,8] however, neither offers a substantive improvement in the prediction of graft survival compared to the Rao KDPI. It is therefore preferable to assign an upper threshold to the value that the KDPI can take when calculated for donors <18 years. A maximum value of 20 has been proposed based on the observed distribution of KDPI values in the Australian donor population.

Simulations conducted for RTAC using retrospective data indicate that the adoption of a 'max-KDPI' threshold of 20 for Australian kidney donors under 18 years will be effective in preventing the allocation of kidneys from paediatric donors to high EPTS recipients via the State Restricted Matching algorithm, with minimal impact on other recipients. Applying a KDPI max of 20 to all kidneys from donors under 18 years reduced the overall proportion of transplants from paediatric donors to recipients 65+, resulted in a slight improvement in the overall correlation between donor and recipient age, and made a negligible difference to simulated transplant rates by age group.

While it would be ideal to implement an alternative KDPI formula for paediatric donors, this will require such a formula to first be developed and validated on an Australian paediatric donor cohort. Until such a formula is available, the 'max-KDPI' approach will be effective in preventing the present unintended consequences of the allocation system.

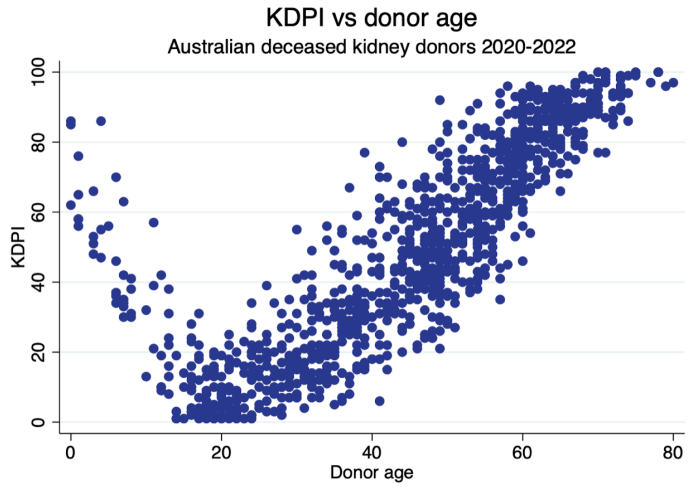

Figure 1: Distribution of KDPI values by donor age, for all deceased donor kidneys transplanted in Australia between 1 January 2020 and 31 December 2022.

[8] Parker WF, Thistlethwaite JR, Ross LF (2016) Kidney donor profile index does not accurately predict the graft survival of pediatric deceased donor kidneys. Transplantation 100:2471–2478