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Insights into the labelling effect of KDPI reporting: the Australian experience

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Abbreviations

ANZDATA – Australia and New Zealand Dialysis and Transplant Registry

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ANZOD – Australia and New Zealand Organ Donor Registry

DBD – donation after brain death

DCD – donation after circulatory death

EPTS – expected post-transplant survival

KDPI – kidney donor performance index

KDRI – kidney donor risk index

NOMS – National Organ Matching Service

Abstract

In 2016 Australia began reporting the Kidney Donor Performance Index (KDPI) with all deceased donor kidney transplant offers despite this not being used in organ allocation rules, offering a unique opportunity to explore the 'labelling effect' of KDPI reporting. We reviewed all kidneys retrieved for transplantation in Australia from 2015-2018 and analysed the association of KDPI reporting with organ non-utilisation, number of offer declines and donor/recipient age and longevity matching. Analyses were stratified by organ failure risk: higher risk (KDPI>80%), standard risk (KDPI 20-79%) and lower risk (KDPI 0-20%). There was no significant difference in organ non-utilisation post KDPI reporting either overall or for higher risk kidneys. KDPI reporting was associated with an increase in offer declines for both higher risk (IRR 1.45, $p=0.007$) and standard risk (IRR 1.22, $p=0.021$) kidneys, but not for lower risk organs. There was a significant increase in recipient age and Expected Post-Transplant Survival score for higher risk kidneys but no differences amongst other groups. We conclude that whilst KDPI reporting in Australia has been associated with an increased number of offer declines for higher risk kidneys, this has not resulted in increased non-utilisation and may have contributed to more appropriate use of these organs.

Background

In November 2016, Australia introduced reporting of the kidney donor profile index (KDPI) with all deceased donor kidney offers¹. The KDPI is a population scaling of the Kidney Donor Risk Index (KDRI) that was designed by the US Scientific Registry of Transplant Recipients to quantify the risk of graft failure associated with a given donor kidney² and has subsequently been validated as a prediction tool in the Australian Context³. KDPI is not used in the

algorithm for organ allocation in Australia⁴, but is calculated and reported to “provide an objective measure of kidney quality when making decisions on organ acceptance”¹ and for future auditing purposes. The detailed donor clinical information available to clinicians at the time of organ offer through the Electronic Donor Record did not change during this period and already contained all of the individual components used to calculate the KDPI.

Concerns have been raised about the potential labelling effect of KDPI reporting in Australia: that clinicians may be more reluctant to accept offers of kidneys with high KDPI resulting in resource wastage in donation coordinator time to allocate kidneys and potentially even increased organ non-utilisation. Similar issues have been debated in the US following the introduction of KDPI use in the Kidney Allocation System⁵⁻⁷. It is also possible that increased awareness of kidney quality at the time of organ offer may result more discerning use of marginal kidneys, and directed use of lower KDPI kidneys, resulting in improved matching between predicted recipient survival and predicted organ survival.

We aimed to undertake a retrospective review of the impact of KDPI reporting with deceased donor kidney offers in Australia on organ acceptance behaviour, organ non-utilisation and explore if this has resulted in improved recipient/organ longevity matching.

In Australia, deceased donor kidney allocation is coordinated nationally through the OrganMatch system according to a uniform allocation protocol developed by the Transplantation Society of Australia and New Zealand (TSANZ)⁴. To briefly summarize, the country is divided into five transplanting regions comprising 17 adult and 6 paediatric renal transplanting services. All kidneys are first offered in a National Allocation which prioritises well matched highly sensitized patients, zero HLA mismatch transplants, paediatric recipients and addresses organ sharing imbalances between regions. If the kidney is not accepted through National Allocation it is offered within the same region as the donor according to region specific allocation rules that consider both HLA matching and waiting time as well as paediatric and other bonuses. If no recipient can be found locally (as is sometimes the case for blood group AB kidneys for example), the organ is once again allocated nationally according to recipient sensitisation and waiting time. Around 20% of kidneys are allocated through the national system, and 80% regionally.

Methods

Population:

A retrospective analysis of all kidneys retrieved for the purpose of transplantation in Australia from January 2015 to December 2018 was conducted using a de-identified data set from The Australia and New Zealand Organ Donor Registry (ANZOD), The Australia and New Zealand Dialysis and Transplant Registry (ANZDATA) and the National Organ Matching Service (NOMS). Kidneys used for multi-organ transplantation (including simultaneous kidney pancreas transplant) were excluded from the analysis.

The Australian KDRI³ was used to determine the KDPI on a scale of 1-100% based on the characteristics of deceased donor kidney used for transplantation in the preceding 3 years.

Australian KDRI Formula

$$\begin{aligned} & \text{Exp}(-0.0194 \times \text{minimum}(\text{donor age}-18,0) \\ & + 0.0128 \times (\text{donor age}-40) \\ & + 0.0107 \times \text{maximum}(\text{donor age}-50,0) \\ & + 0.126 \text{ if the donor had a history of treated hypertension} \\ & + 0.130 \text{ if the donor had a history of diabetes} \\ & + 0.220 \times ((\text{donor terminal creatinine (in } \mu\text{mol/L)})/88.4)-1) \\ & - 0.209 \times ((\text{donor terminal creatinine (in } \mu\text{mol/L)})/88.4)>1.5) \text{ if } ((\text{donor terminal creatinine (in } \mu\text{mol/L)})/88.4)>1.5 \\ & + 0.0881 \text{ if donor cause of death stroke} \\ & - 0.0464 \times ((\text{height(in cm)}-170)/10) \\ & - 0.0199 \times (\text{weight(in kg)}<80) \text{ if weight } <80\text{kg} \\ & + 0.133 \times \text{if planned donation pathway DCD} \end{aligned}$$

Kidneys were categorised according to risk of graft failure based on KDPI for stratified analysis: higher risk (KDPI>80%), standard risk (KDPI 21-80%), lower risk (KDPI≤20%).

Outcomes and Exposure:

Two primary outcomes were considered to assess the impact of KDPI reporting: 1) organ non-utilisation and 2) number of offer declines prior to acceptance. Non-utilisation was defined as a kidney that was retrieved for the purpose of transplantation but not transplanted into a recipient. Number of declines was calculated using the allocation rankings generated by NOMS according to Australia's national kidney allocation algorithm⁴. Prospective cytotoxic T cell cross matching is performed for all potential kidney transplants

in Australia using standardized recipient serum trays across all tissue typing laboratories in the country and organs are not offered in the presence of a positive cytotoxic T cell crossmatch. As such, all potential recipients with a positive cytotoxic T cell crossmatch on current serum were excluded from the list of offers and the number of declines was calculated based on the number of potential recipients ranked higher than the eventual recipient who did not receive a kidney from that donor. The number of offer declines prior to organ discard could not be determined for kidneys not utilised for transplantation and therefore these were excluded from this analysis.

Secondary outcomes included mean recipient age and mean Expected Post Transplant Survival (EPTS) score, by KDPI groupings. EPTS was calculated according to the following formula⁸ and scaled to a reference population of all patients active on the Australian deceased donor transplant waiting list at 31st December 2014.

Raw EPTS Score Formula

$0.047 \times \text{maximum}((\text{age at transplant}-25),0)$
- $0.015 \times \text{max}((\text{age at transplant}-25),0)$ if history of diabetes
+ 0.398 if prior solid organ transplant
- 0.237 if prior solid organ transplant and history of diabetes
+ $0.315 \times \log(\text{years on dialysis}+1)$
- $0.099 \times \log(\text{years on dialysis}+1)$ if history of diabetes
+ 0.130 if years on dialysis = 0
- 0.348 if years on dialysis = 0) and history of diabetes
+ 1.262 if history of diabetes

The primary exposure was donation before or after 8th November 2016, the point at which KDPI reporting to the recipient clinician was introduced.

Statistical Methods:

Donor characteristics before and after KPDI report were compared using two sample T test for normally distributed continuous variables, Wilcoxon rank-sum for non-normally distributed continuous variables and Pearson's chi-squared test for categorical variables. Trends in all outcomes across the period are shown graphically with smoothed quarterly rates.

A multilevel logistic regression model with random intercepts for kidneys clustered within donors, clustered within transplant regions was used to test for a difference in odds of non-utilisation before and after KDPI reporting. A multilevel negative binomial model was used to test a difference in the number of offer declines between the two eras. Due to the high number of zero declines in the dataset, a zero inflated negative binomial model was considered, however, there was no clinical or statistical justification to use this model in preference to the standard negative binomial model.

In all models the assumption of a linear relationship between continuous independent variables and the linear predictor was tested by comparing the fit of alternative fractional polynomial models and by plotting the linear predictor against the mean of quantiles of each independent variable. Where significant violations were found, linear splines or clinically meaningful categorisations were used. All potential confounders with a p value of <0.2 on univariate analysis in the entire cohort were included in the adjusted models.

Models significant on univariate analysis were sequentially adjusted for 1) log KDRI, 2) individual donor factors and 3) regional transplant waiting-list of the first of each month to adjust for changes in the length of waiting lists over time. Donor factors considered for inclusion in the models were: age, gender, body mass index, ABO blood group, cause of death (stroke vs non-stroke), donation pathway (brain death vs circulatory death), diabetes, hypertension, history of smoking, hepatitis C antibody positivity, and terminal creatinine.

Changes in the mean age and EPTS before and after KDPI reporting by KDPI grouping were assessed graphically and tested for difference using a Wilcoxon rank-sum test. Correlation between donor and recipient age and KDPI/EPTS before and after KDPI reporting were assessed using Spearman's rank-order correlation coefficient and tested for difference across the two eras using Bootstrapping methods.

Exploratory analysis was conducted examining time as a continuous variable with a spline knotted at the time of KDPI reporting to test for significant trends pre and post reporting.

Statistical analysis was performed using Stata/IC 15.1 (StataCorp, College Station TX).

Results

A total of 3,451 kidneys were retrieved for the purposes of transplantation during the study, 232 (6.7%) were used for multi-organ transplants and excluded from the analysis. Of the remaining 3,219 kidneys, 198 (6.2%) were not utilised for transplantation. Thirty-four recipients (1.1%) did not have a match rank recorded in the NOMS dataset and these transplants were excluded from the subsequent analysis. These may have represented data errors, linkage errors or transplants that occurred in exceptional circumstances.

Donor characteristic of all kidneys retrieved for transplantation in the period prior to and since KDPI reporting are shown in table 1 (excluding those used for multi-organ transplant). Donors in the post-KDPI report era were younger (median age 48 vs 51 years, $p=0.015$), less likely to have died from stroke (30% vs 43.8%, $p=0.028$) and more likely to be hepatitis C antibody positive (2.4% vs 0.6%, $p<0.001$). There was a slight reduction in both median KDRI (1.29 vs 1.32, $p=0.006$) and median KDPI (51% vs 53%, $p=0.042$) in the latter period (note that multiorgan transplants were excluded from this population and that KDPI in Australia is based on characteristics of kidneys transplanted in the preceding 3 years). Other characteristics were similar, although there was a difference in the geographical distribution of donors between the two periods.

Non-Utilisation:

Figure 1 shows a non-linear relationship between KDPI and kidney non-utilisation across the entire study period. There was no difference in the overall non-utilisation rate in the pre and post KDPI reporting eras (5.8% vs 6.4%, $p=0.478$). Figure 2 shows the trends in non-utilisation across the study period separated by KDPI categories. There was no significant increase in the odds of non-utilisation for kidneys retrieved after KDPI reporting in Australia (OR 1.1, 95% CI 0.82-1.47, $p=0.53$). There was a trend towards increased non-utilisation in kidneys with KDPI >80% however, this did not reach statistical significance (OR 1.57, 95% CI 0.98-2.51, $p=0.06$) and may have represented long term fluctuations in non-utilisation rates in this group (supplementary Figure S1). Table 2 shows the odds of non-utilisation post KDPI reporting across risk categories.

Offer Declines:

The distribution of offer declines was highly skewed with a median of one for lower and standard risk kidneys and three for higher risk kidneys, and a large number of outliers.

Distribution of offer declines by KDPI groupings are shown in figure 3.

On univariate analysis, there was no change in offer declines after KDPI reporting when considering all kidneys (IRR 1.13, 95%CI 0.98-1.30, $p=0.086$). When stratifying by KDPI grouping, there was a significant increase for both higher risk kidneys and standard risk kidneys (IRR 1.45, 95%CI 1.11-1.89, $p=0.007$ and IRR 1.22, 95%CI 1.03-1.45, $p=0.021$, respectively) but the number of offer declines per kidney did not differ across the two periods for lower risk kidneys (IRR 0.8, 95%CI 0.57-1.12, $p=0.194$) see table 3.

Table 3 also shows the results of adjusted models. For higher risk kidneys, the increase in offer declines after KDPI reporting persisted after sequential adjustment for log KDRI (model 1), donor factors (model 2), waiting list numbers (model 3), and donor factors and waitlist numbers (model 4) (adjusted IRR range 1.38-1.51, $p<0.05$ for all). However, for standard risk kidneys, the increase in offer declines was attenuated by adjustment for individual donor factors and waiting list numbers.

Exploratory analysis showed that for higher risk kidneys there was no trend in increased offer declines prior to KDPI reporting (IRR 1.00 per month, 95%CI 0.98-1.02, $p=0.965$), however, after KDPI reporting there was a significant ongoing increase over time (IRR 1.03 per month, 95%CI 1.01-1.05, $p=0.006$).

Changes in Recipient Characteristics:

Overall there was no difference in mean recipient age or EPTS across the two periods, however for higher risk kidneys there was a significant increase in both recipient age and EPTS in the period after KDPI reporting (median age 62 vs 59 years, $p<0.001$; median EPTS 61% vs 54% $p=0.035$). There were no significant differences in recipient age or EPTS across the two periods for standard or lower risk organs.

Figure 4 shows the correlation between donor and recipient age and KDPI/EPTS before and after KDPI reporting for the entire cohort. There was no significant change in the correlation between donor age and recipient age following KDPI reporting (rho 0.318 vs 0.260, difference 0.059, $p=0.082$) however there was a modest but significant increase in the correlation between KDPI and EPTS (rho 0.286 vs 0.217, difference 0.069, $p=0.037$)

Discussion

In the wake of the United States' redesign of their Kidney Allocation System in 2014, there has been growing interest globally surrounding the role of recipient/organ longevity matching in kidney transplant allocation^{9–11}. Following validation of a modified version of the US KDPI³, Australia began reporting this score with all kidney offers despite it not being incorporated into local allocation algorithms and without changes to the clinical information available to accepting clinicians, offering an opportunity to assess for potential labelling effects associated with the reporting of this organ quality index. We found that KDPI reporting has been associated with a 45% increase in the number of organ offer declines for higher risk (KDPI>80%) kidneys without a significant increase in the rate of non-utilisation. Although there was no formal change in allocation policy, the significant increase in the median age and EPTS of recipients receiving higher risk kidneys and a modest improvement in KDPI/EPTS correlation following KDPI reporting suggests that these kidneys may be being directed to recipients with lower expected survival.

Our results suggest there is at a degree of labelling effect in KDPI reporting, given that the component donor information was available prior to the introduction of KDPI reporting. This is consistent with previous studies in the US. Examining changes in the kidney non-utilisation rate after the introduction of KDPI use in the US, Bae et al¹² found that although there was no overall increase in non-utilisation rates, amongst kidneys that were previously labelled as 'standard criteria' that were reclassified as 'high risk' (KDPI>85%) there was a significant increase in odds of non-utilisation (aOR 1.42, 95%CI 1.07-1.89, $p=0.02$). In an opportunistic study, Stewart et al¹³ reported on the impact of KDPI labelling when the index was incorrectly calculated for a 30 day period in the US due to a programming error, resulting in erroneously high KDPI values being displayed with organ offers. During this period the kidney non-utilisation rate did increase, but not to the degree

that would have been predicted based on the usual relationship between KDPI and organ non-utilisation. The authors concluded that although the elevated non-utilisation rate was “most likely attributable to the erroneously high KDPIs” the findings suggested that “clinicians and patients did not rely heavily on this single number”.

Unlike these studies, we did not find a significant increase in organ non-utilisation but rather saw an association between KDPI reporting and the more sensitive measure of offer declines. This may reflect that, despite an unexplained increase in 2013, Australia’s non-utilisation rate remains low compared to other countries¹⁴, likely reflecting a number of systemic factors including a close working relationship between the donation and transplantation sectors. Alternatively, due to smaller number of organ retrievals, our study may have been underpowered to detect a true increase in non-utilisation. The absence of a significant impact on organ non-utilisation, even for higher risk kidneys, is reassuring that an unintended labelling effect has not resulted in a major increase in organ wastage. In fact, rather than detrimental impacts, there is a suggestion that it has been associated with the potential benefit of more appropriate organ allocation, although longer term outcome data is required to confirm this hypothesis.

The major limitation to our study is its retrospective, observational nature. It is not possible to state whether the observed changes were caused by KDPI reporting or represent broader cultural changes in the kidney transplant sector that coincided with KDPI reporting. Since the launch of a coordinated national reform program in 2008 to implement a “world’s best practice approach to organ and tissue donation for transplantation”¹⁵ Australia has seen a more than doubling of the annual number of deceased organ donors¹⁶. As a result, the number of patients active on the deceased donor kidney transplant waiting list has been gradually falling, down to 39 patients per million population at the end of 2017^{17,18}. The associated reduction in waiting times may motivate clinicians or patients to decline a higher risk offer and await a more suitable organ. Although the KDRI shows only moderate discrimination of death censored graft survival in the Australian population (Harrel’s C statistic 0.63)³ it may provide an additional tool to assist clinicians in making decisions regarding offer acceptance.

Unlike the US, the kidney allocation system in Australia does not currently address organ and recipient longevity matching. Clinical discretion provides a mechanism to ensure that higher risk kidneys are not transplanted into patients who would benefit from waiting for a better organ offer, however, there is no system for prioritising the use of kidneys with the best predicted survival. Maximising the total benefit is one of a number of competing ethical principles that should be considered when deciding on the optimal use of a scarce resource such as organs for transplantation but this must be weighed against the imperative to ensure equitable access to organs across the population¹⁹. There was a marginal increase in the correlation between KDPI and recipient EPTS following the introduction of KDPI reporting. This finding was primarily driven by the increase in EPTS for recipients of kidneys from higher risk donors whereas for the 20% of kidneys with the best predicted survival, we did not observe any significant difference in recipient age or EPTS. This highlights the need for ongoing monitoring to ensure that the quality of outcomes for higher risk recipients who are receiving higher risk kidneys are maintained and supports the argument that allocation rules prioritising the use of lower risk kidneys to patients with the best predicted survival, such as those used in the US KAS, are likely to be required to achieve maximum utility of deceased donor kidneys.

The use of administrative datasets to analyse clinical behaviour produces limitations in our analysis. We have determined offer declines based on allocation ranking, however, it is not clear if each potential recipient was actively considered before the organ was declined or if in some circumstances clinicians may have declined organs for all potential recipients at their centre, skipping large portions of the allocation list. Exclusion of CDC positive T cell crossmatches also required some assumptions that may not reflect the nuances of histocompatibility testing where B cell and flow crossmatches may be used to aid interpretation of equivocal results. Organ acceptance behaviours vary significantly across transplanting regions in Australia, we have attempted to account for this clustering by using multilevel modelling in our analysis, however this may incompletely capture this variation in practice.

Australia's decision to report a modification of the US's KDPI with all kidney offers has provided a unique opportunity to explore the potential labelling effect of this index. We

conclude that whilst KDPI reporting has been associated with an increased number of offer declines for higher risk and, to lesser extent, standard risk kidneys, this has not resulted in increased non-utilisation of kidneys and may have contributed to a small improvement in donor/recipient age matching and KDPI/EPTS matching for higher risk kidneys. Optimising the utility of lower risk kidneys is likely to require changes in allocation policies in addition to reporting of survival indices.

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Disclosure

The authors of this manuscript have no conflicts of interest to disclose as described by the *American Journal of Transplantation*.

Data Availability Statement

The data that support the findings of this study are available from the Australia and New Zealand Dialysis and Transplant Registry (ANZDATA)²⁰. Restrictions apply to the availability of these data, which were used under license for this study. Data can be requested from www.anzdata.org.au according to the registry's data release policies.

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Table Legends

Table 1: Donor characteristics of kidneys retrieved prior to and after Kidney Donor Performance Index (KDPI) reporting. *IQR – interquartile range; BMI – body mass index; DBD – donation after brain death; DCD – donation after circulatory death; NSW – New South Wales; ACT – Australian Capital Territory; VIC – Victoria; TAS – Tasmania; QLD- Queensland; SA – South Australia; NT – Northern Territory; WA – Western Australia.*

Table 2: Changes in organ non-utilisation following Kidney Donor Performance Index (KDPI) reporting stratified by graft failure risk. Multilevel models with kidneys clustered within donors, clustered within transplant regions. *N – number of kidneys retrieved; OR – odds ratio; CI – confidence interval.*

Table 3: Changes in number of offer declines following Kidney Donor Performance Index (KDPI) reporting stratified by graft failure risk. Multilevel models with kidneys clustered within donors, clustered within transplant regions. Multivariate models adjusted for: Model 1: exponentiated kidney donor risk index; Model 2: donor factors: age (with linear spline knotted at age 50), ABO blood group, cause of death (stroke vs non-stroke), donation pathway (donation after brain death vs donation after circulatory death), diabetes, hypertension, history of smoking, hepatitis C antibody positivity and terminal creatinine; Model 3: number of patients of the regional waiting list on the first of the month; Model 4: donor factors in model 2 and waiting list numbers. *IRR – incidence risk ration; aIRR – adjusted IRR; CI – confidence Interval*

Table 4: Median recipient age and expected post-transplant survival (EPTS) score prior to and following kidney donor performance index (KDPI) reporting stratified by graft failure risk. *IQR -interquartile range.*

Figure Legends

Figure 1: Percent of kidneys retrieved but not used for transplantation but kidney donor performance index (KDPI) deciles.

Figure 2: Percentage of kidneys retrieved for transplantation but not utilised over time stratified by graft failure risk. Quarterly rates and three quarterly rolling averages are

shown. The purple line signifies when kidney donor performance index (KDPI) reporting with organ offers commenced.

Figure 3: Number of organ offer declines prior to acceptance stratified by graft failure risk.

Figure 4: Correlation between donor and recipient factors. Panels a and b show the correlation between donor and recipient age before and after kidney donor performance index (KDPI) reporting. Panels c and d show the correlation between KDPI and expected post-transplant survival (EPTS) score before and after KDPI reporting. Each circle represents a single transplant event.

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Supporting Information

Additional supporting information may be found online in the Supporting Information section at the end of the article.

Table 1

		Pre-KDPI Reporting	Post KDPI Reporting	p-value
	<i>N</i>	1362	1857	
<i>Donor Age, median (IQR)</i>		51 (37, 61)	48 (35, 60)	0.015
<i>Gender</i>				0.34
	<i>Male</i>	753 (55.3%)	1058 (57.0%)	
	<i>Female</i>	609 (44.7%)	799 (43.0%)	
<i>BMI (kg/m²)</i>				0.57
	<i>Underweight (<18.5)</i>	30 (2.2%)	53 (2.9%)	
	<i>Normal (18.5-<25)</i>	496 (36.4%)	642 (34.6%)	
	<i>Overweight(25-<30)</i>	459 (33.7%)	652 (35.1%)	
	<i>Obese(>=30)</i>	364 (26.7%)	488 (26.3%)	
	<i>Unknown</i>	13 (1.0%)	22 (1.2%)	
<i>Donor Blood Group</i>				0.067
	<i>O</i>	609 (44.7%)	908 (48.9%)	
	<i>A</i>	558 (41.0%)	702 (37.8%)	
	<i>B</i>	156 (11.5%)	185 (10.0%)	

	AB	39 (2.9%)	62 (3.3%)	
Cause of death				0.028
	Non-stroke	765 (56.2%)	1115 (60.0%)	
	Stroke	597 (43.8%)	742 (40.0%)	
Donation Pathway				0.32
	DBD	972 (71.4%)	1295 (69.7%)	
	DCD	390 (28.6%)	562 (30.3%)	
Donor Diabetes				0.21
		116 (8.5%)	136 (7.3%)	
Hypertension				0.10
		386 (28.6%)	478 (26.0%)	
Smoker (Current or Former)				0.76
		859 (63.1%)	1181 (63.6%)	
Donation Region				<0.001
	NSW/ACT	414 (30.4%)	541 (29.1%)	
	VIC/TAS	431 (31.6%)	655 (35.3%)	
	SA/NT	143 (10.5%)	121 (6.5%)	
	QLD	250 (18.4%)	366 (19.7%)	
	WA	124 (9.1%)	174 (9.4%)	
Hepatitis C Antibody Positive				<0.001
		8 (0.6%)	44 (2.4%)	
Procurement Biopsy Performed		206 (15.1%)	227 (12.2%)	0.017
	KDRI, median (IQR)	1.32 (1.05, 1.76)	1.29 (1.02, 1.67)	0.006
	KDPI, median (IQR)	53 (29, 78)	51 (27, 75)	0.042

Table 2

	N	OR	95% CI	P Value
All	3219	1.1	[0.82]-[1.47]	0.53
KDPI >80%	664	1.57	[0.98]-[2.51]	0.06
KDPI 21-79%	2026	0.92	[0.61]-[1.40]	0.71
KDPI 0-20%	529	1.42	[0.49]-[4.14]	0.52

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Table 3

Population	n	Univariate			Model 1			Model 2			Model 3			Model 4		
		IRR	95% CI	P Value	aIRR	95% CI	P Value	aIRR	95% CI	P Value	aIRR	95% CI	P Value	aIRR	95% CI	P Value
KDPI >80%	574	1.45	[1.11]- [1.89]	0.007	1.51	[1.16]- [1.95]	0.002	1.46	[1.13]- [1.87]	0.003	1.4	[1.07]- [1.83]	0.015	1.38	[1.05]- [1.82]	0.023
KDPI 21-80%	191	1.22	[1.03]- [1.45]	0.021	1.22	[1.03]- [1.44]	0.022	1.16	[0.98]- [1.36]	0.085	1.16	[0.97]- [1.39]	0.106	1.1	[0.92]- [1.32]	0.298
KDPI 0-20%	502	0.8	[0.57]- [1.12]	0.194	0.79	[0.56]- [1.11]	0.166	0.8	[0.57]- [1.13]	0.206	0.75	[0.53]- [1.06]	0.104	0.77	[0.55]- [1.08]	0.131
All Kidneys	2987	1.13	[0.98]- [1.30]	0.086	1.19	[1.05]- [1.36]	0.008	1.16	[1.02]- [1.32]	0.026	1.08	[0.92]- [1.26]	0.349	1.07	[0.91]- [1.24]	0.409

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Table 4

	<i>Pre KDPI Reporting</i>	<i>Post KDPI Reporting</i>	<i>P Value</i>
Recipient Age, Median (IQR)			
<i>KDPI >80%</i>	59.0 (50.0, 65.0)	62.0 (55.0, 67.0)	<0.001
<i>KDPI 21-80%</i>	53.0 (41.5, 61.5)	54.0 (43.0, 62.0)	0.13
<i>KDPI 0-20%</i>	48.0 (41.0, 57.0)	47.0 (34.0, 58.0)	0.24
<i>All Kidneys</i>	54.0 (43.0, 62.0)	55.0 (43.0, 63.0)	0.18
Recipient EPTS, Median (IQR)			
<i>KDPI >80%</i>	54.0 (32.0, 73.0)	61.0 (41.0, 77.0)	0.035
<i>KDPI 21-80%</i>	41.0 (16.0, 67.0)	42.0 (19.0, 69.0)	0.29
<i>KDPI 0-20%</i>	31.5 (14.0, 56.0)	27.0 (7.0, 53.0)	0.086
<i>All Kidneys</i>	43.0 (21.0, 68.0)	43.0 (20.0, 69.0)	0.76

Non-Utilisation Rate by KDPI Deciles

Australia 2015-2018

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Distribution of Kidney Offer Declines by KDPI Grouping Kidney Only Transplants Australia 2015-2018

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Donor/Recipient Age and KDPI/EPTS Correlations Australian Deceased Donor Kidney Transplants 2015-2018

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Non-Utilisation Rate by KDPI Deciles
Australia 2015-2018

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ajt_15656_f3.png

Donor/Recipient Age and KDPI/EPTS Correlations

Australian Deceased Donor Kidney Transplants 2015-2018

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