

The Kidney Allocation System (KAS)

The First Two Years

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Prepared for OPTN Kidney Transplantation Committee

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Background

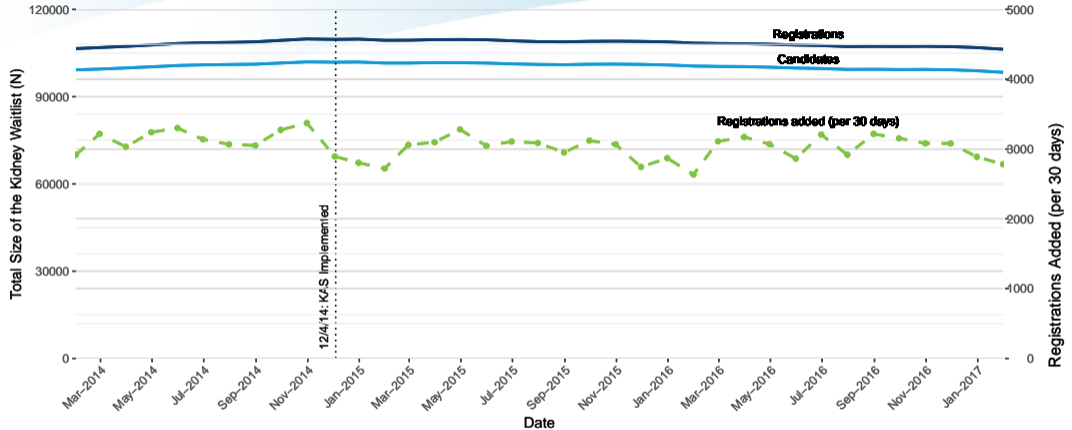
- KAS implemented December 4, 2014
- Key goals:
 - Make better use of available kidneys
 - Increase transplant opportunities for difficult-to-match patients (increased equity)
 - Increase fairness by awarding waiting time points based on dialysis start date
 - Have minimal impact on most candidates

Background

- Performance tracked monthly through June (“out of the gate” reports)
- Six month report completed September 2015
- One year report completed April 2016
- Two year analysis now completed
 - Post-KAS years only, comparing Post-KAS Year 1 to Post-KAS Year 2
 - Post-KAS Year 1: December 4, 2014 - December 3, 2015
 - Post-KAS Year 2: December 4, 2015 - December 3, 2016
 - New: DGF rates, stratified
 - New: One-year survival outcomes, overall and stratified
 - New: Relisting rates pre- vs. post-KAS

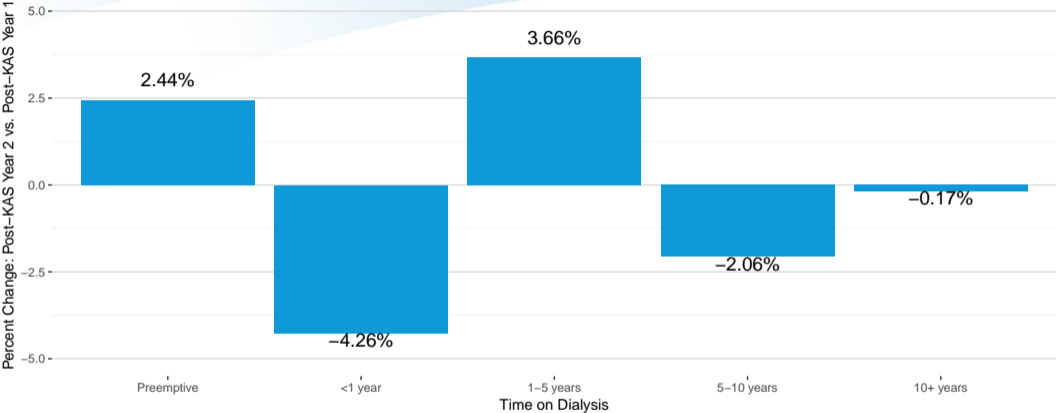
Kidney Waiting List Trends

Trends in the Kidney Waiting List



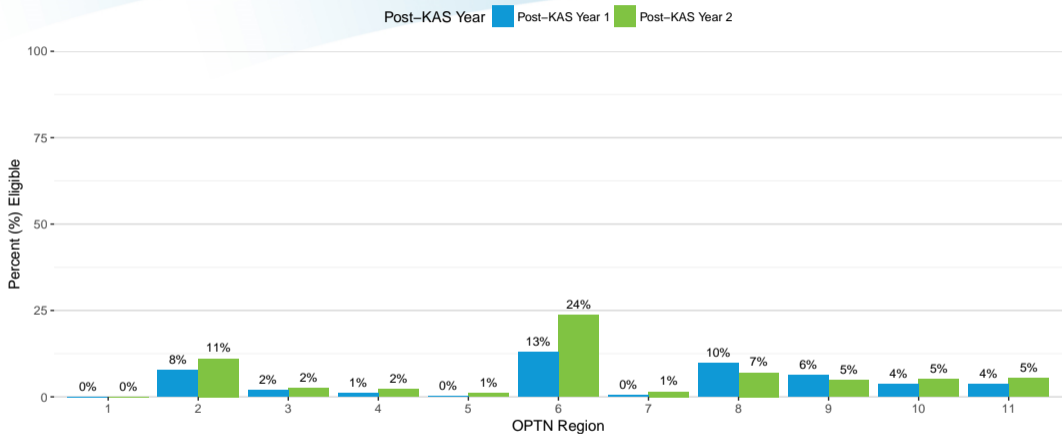
The size of the kidney waiting list is slowly yet steadily decreasing; less than 1% new kidney registrations were added post-KAS Year 2 vs. Year 1.

Changes in Dialysis Listing Patterns, Post-KAS



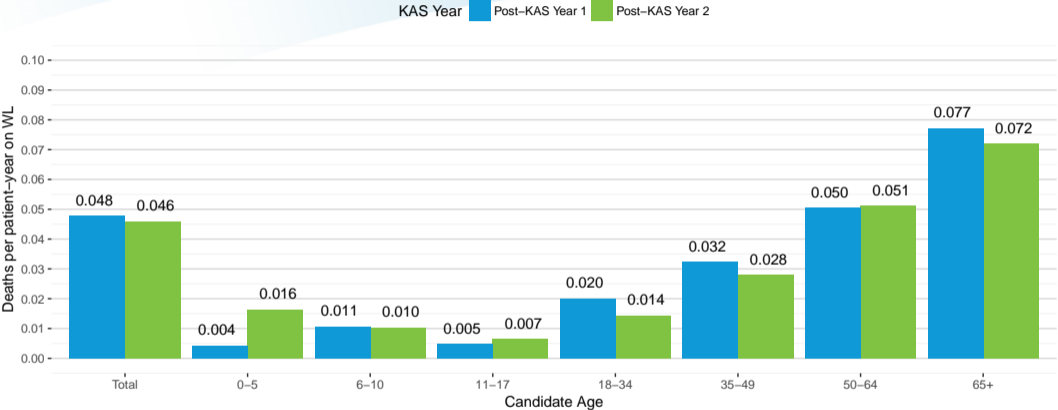
Pre-emptive listings are still increasing. Candidates with longer dialysis time decreased with subsequent increases for candidates with 1-3 years.

A2/A2B Waiting List Eligibility by OPTN Region



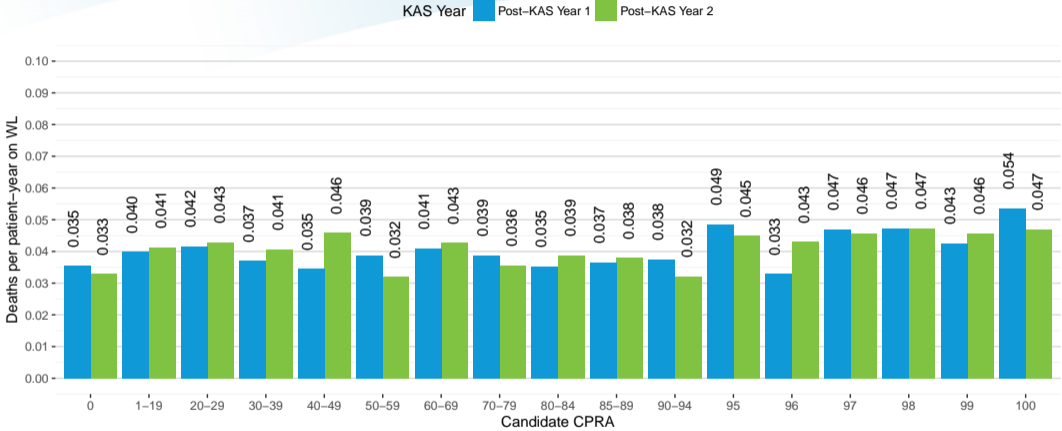
As of 11/30/16, 4.5% of blood type B registrations on the WL were indicated as eligible for A2/A2B kidneys.

Waiting List Mortality Rates by Candidate Age



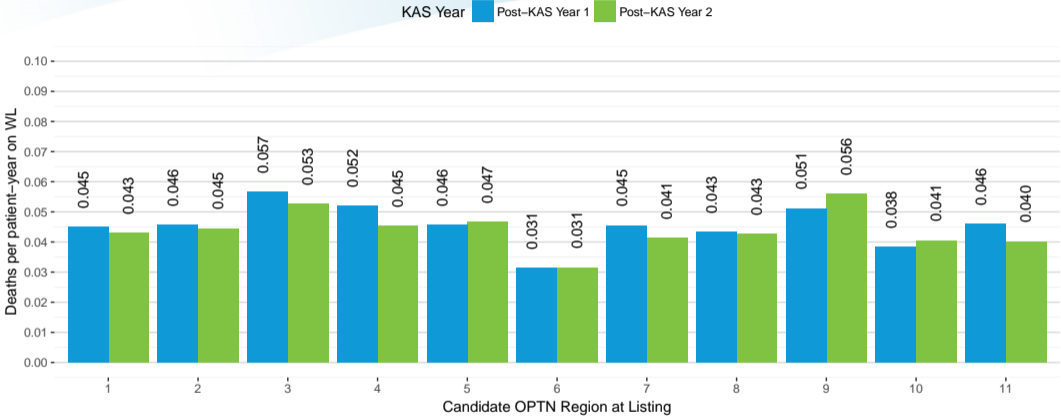
Candidates aged 18-34 and 35-49 had significant decreases in WL mortality rates post-KAS Year 2 vs. Year 1. The pediatric 0-5 increase is not significant; the sample size is very small, so any death substantially raises the rate.

Waiting List Mortality Rates by Candidate CPRA



Waiting list mortality rates had no significant changes post-KAS Year 2 vs. Year 1.

Waiting List Mortality Rates by Region



Waiting list mortality rates have remained virtually unchanged. Region 4 had the only significant change, decreasing post-KAS Year 2 vs. Year 1.

Switching Status Within 60 Days of Listing



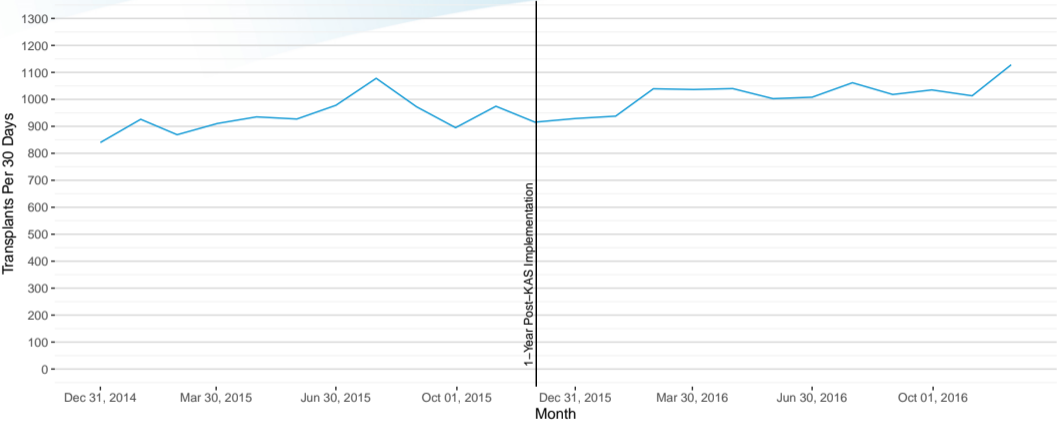
The number and percent of candidates listed as active and remaining active at 60 days post-listing has been increasing.

Other Noteworthy Waitlist Findings

- By OPTN region, the distribution of registrations added by candidate characteristics such as age, ethnicity, dialysis time, and CPRA have not changed post-KAS Year 1 to post-KAS Year 2.
 - Region 3 has a higher percent of Black than White candidates.
 - Regions 2, 4, and 11 have the highest percent of CPRA 100 candidates.

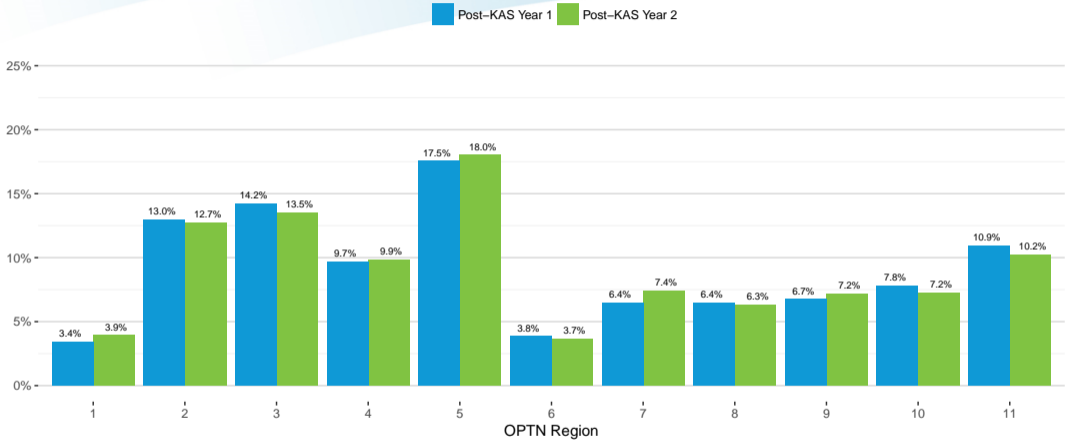
Deceased Donor Kidney Transplants

Solitary Deceased Donor Transplants Under KAS



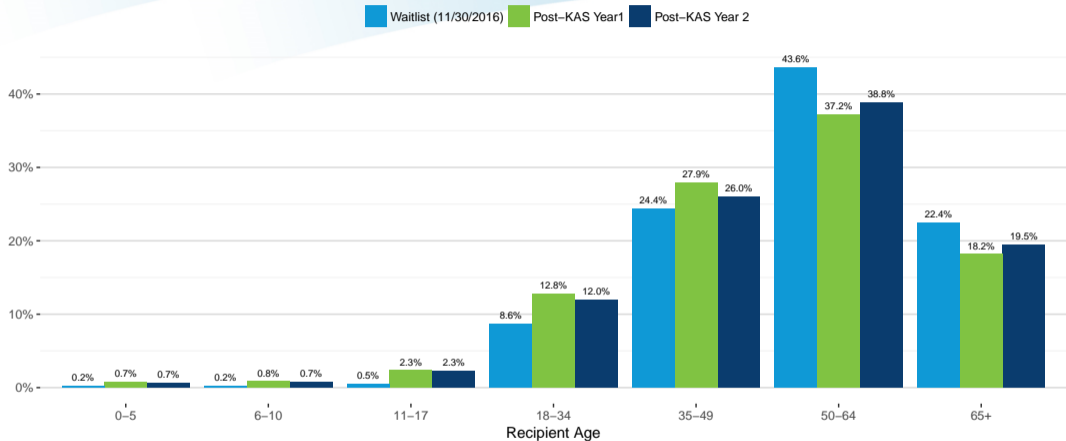
Transplants increased 9.1% post-KAS, from 11,392 Post-KAS Year 1 to 12,433 Post-KAS Year 2, though the rise in transplants cannot be entirely attributed to KAS.

Geographic Distribution of Kidney Transplants



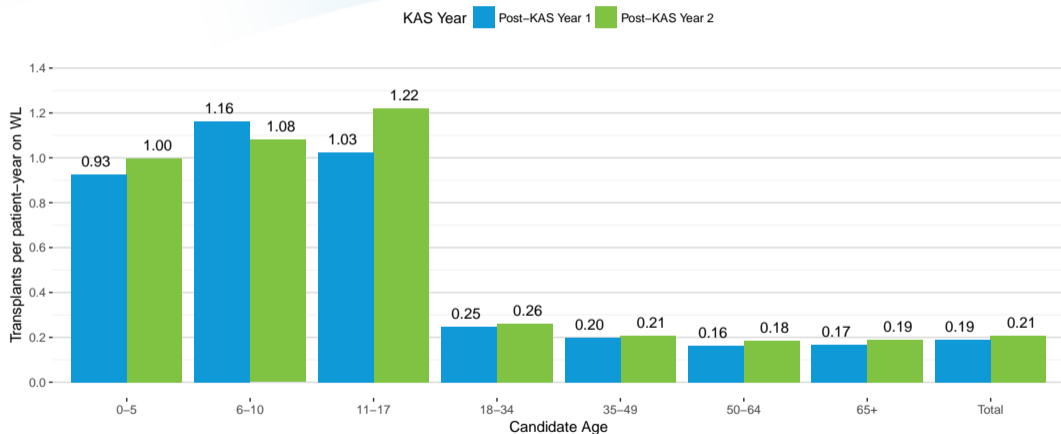
No substantial changes in any region post-KAS Year 2 vs. post-KAS Year 1.

Deceased Donor Transplants by Recipient Age



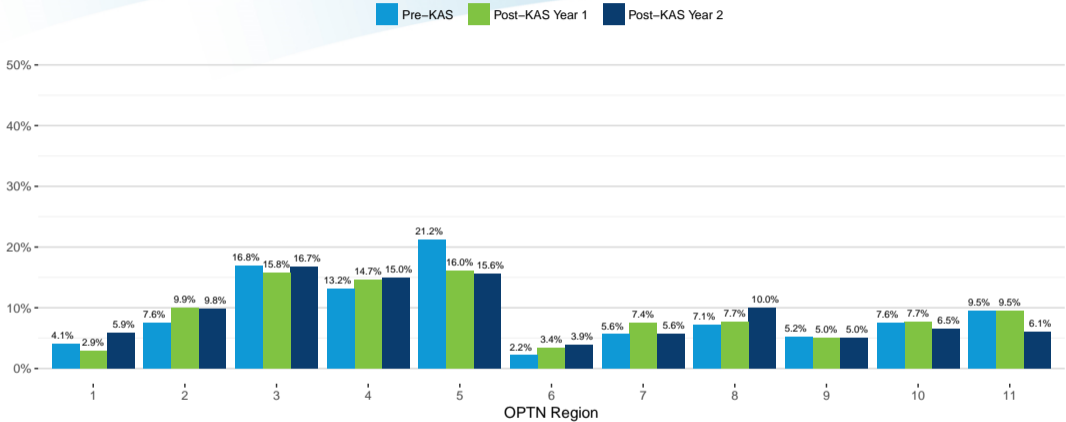
The percent of transplants to younger candidates (18-49) decreased slightly, and transplants to 50+ candidates increased slightly.

Transplant Rates (per Active Patient-Year) by Candidate Age



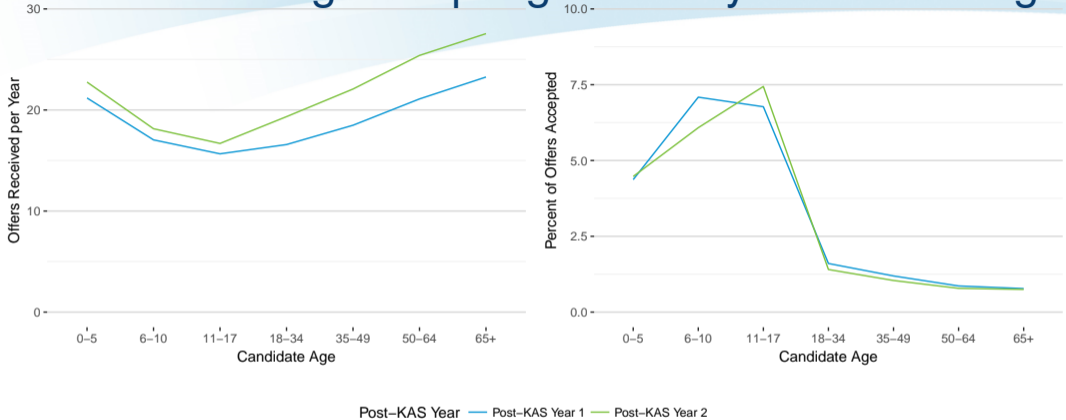
Transplant rates were higher overall, as well as for almost every age group. The slight decrease for ages 6-10 was not significant.

Geographic Distribution of Pediatric Kidney Transplants



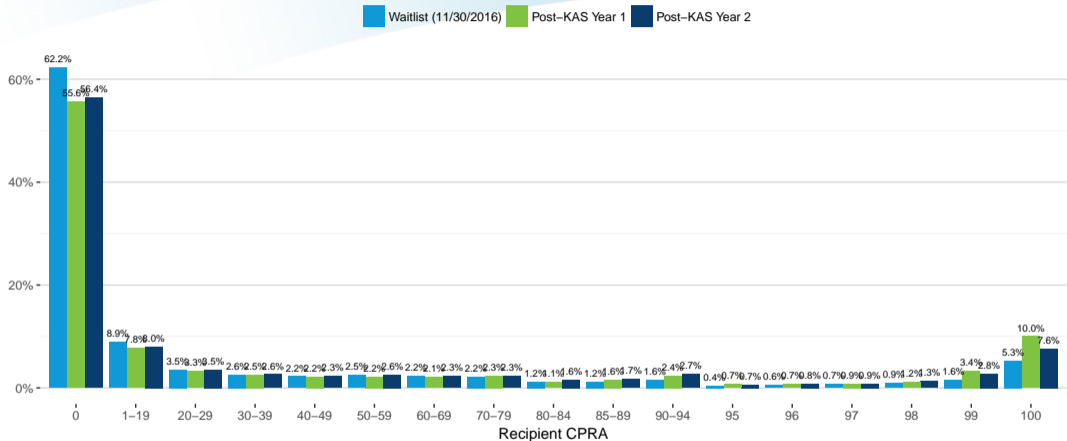
Post-KAS, most regions had higher or similar percent of pediatric transplants Year 2 vs. Year 1; regions 7, 10, and 11 had a decrease in pediatric transplants, while regions 1 and 8 saw increases.

Rates of Receiving/Accepting Offers by Candidate Age



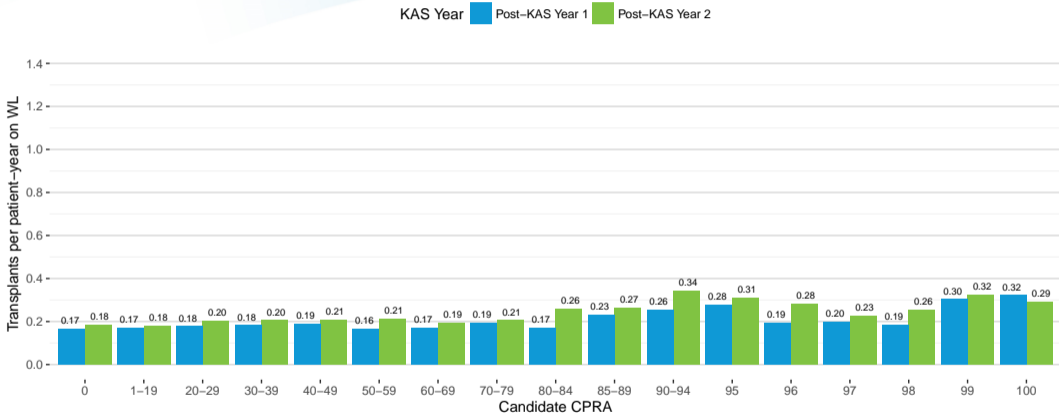
Offer rates were higher Post-KAS Year 2 vs. Post-KAS Year 1 for all age groups, and there was a drop in acceptance rates Year 2 for pediatrics age 6-10.

Deceased Donor Transplants by Recipient CPRA



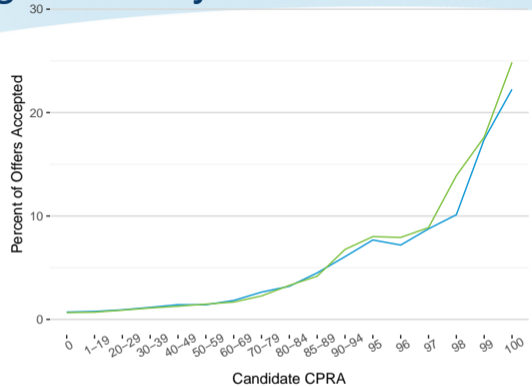
Transplants dropped for CPRA 99-100% in the 2nd year post-KAS.

Transplant Rates (per Active Patient-Year) by Candidate CPRA



Recall that pre-KAS, CPRA 80-89% had the highest transplant rates, and this shifted to CPRA 99-100% post-KAS. Post-KAS Year 2, transplant rates to CPRA 100% dropped slightly, and increased for all other CPRA groups.

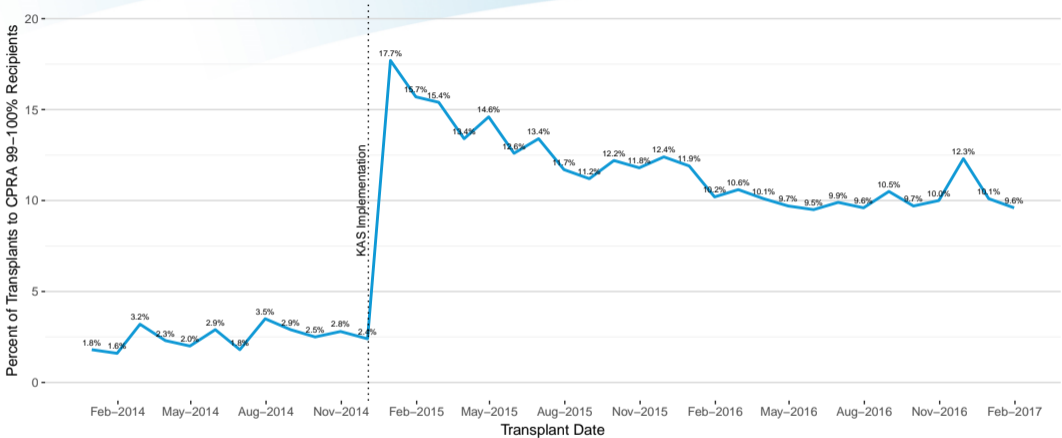
Rates of Receiving/Accepting Offers by Candidate CPRA



Post-KAS Year — Post-KAS Year 1 — Post-KAS Year 2

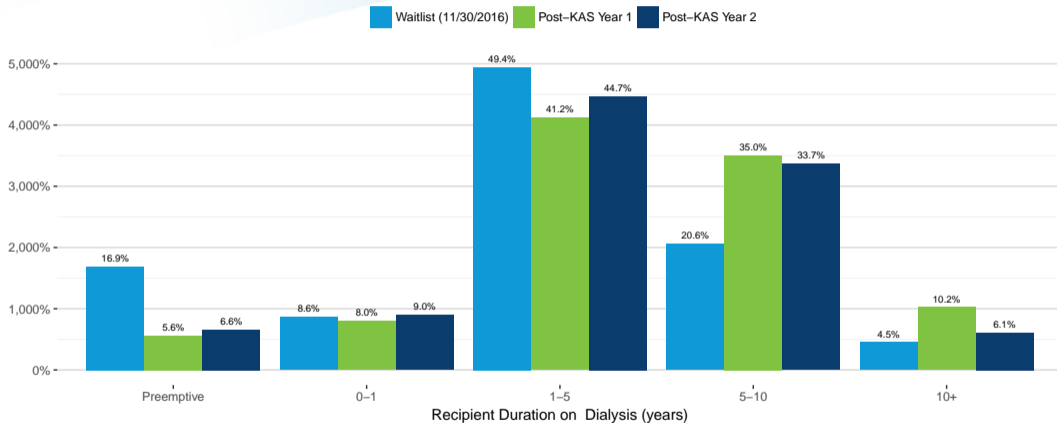
Offer rates increased for all CPRA groups except the very highly sensitized candidates.

CPRA 99-100% Recipient “Bolus Effect”



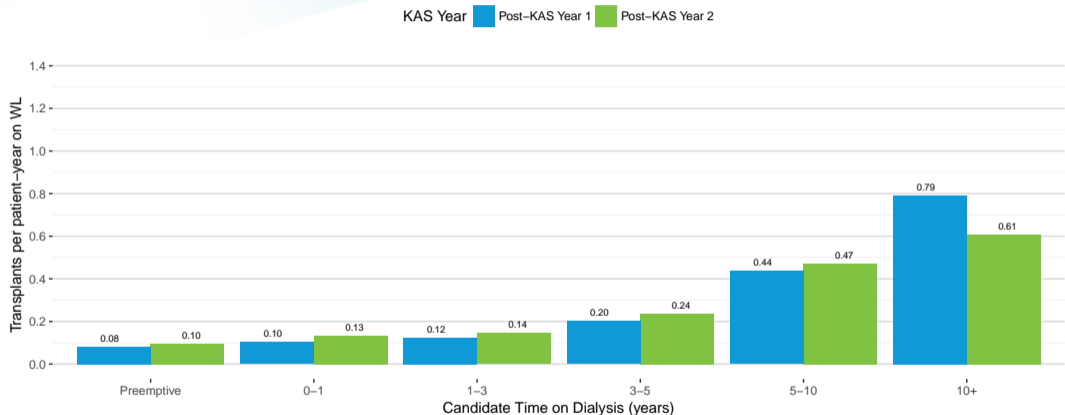
Transplants to CPRA 99-100% patients rose sharply after KAS but have tapered to around 10%.

Deceased Donor Transplants by Recipient Duration on Dialysis



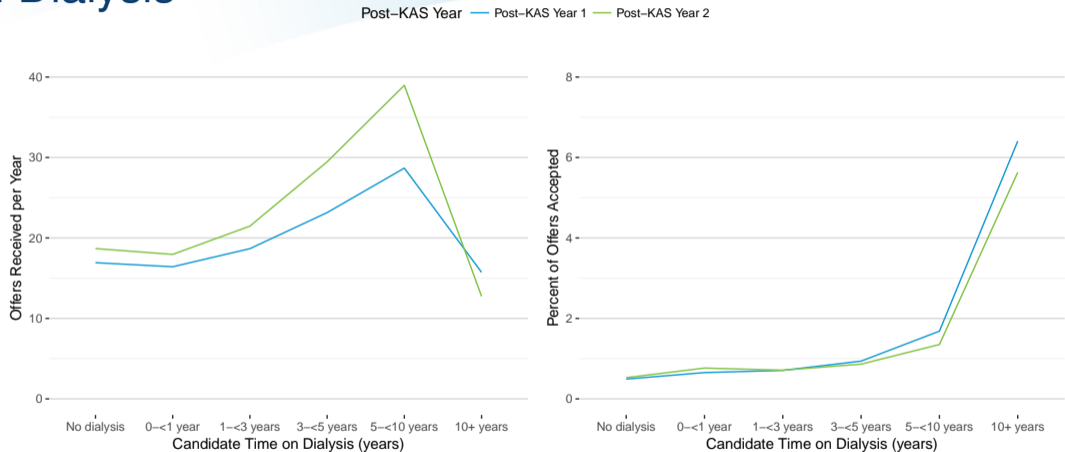
Transplants to long dialysis duration recipients decreased in the 2nd year post-KAS. Compared to pre-KAS (not shown), transplants remain higher for recipients with 5+ years of dialysis.

Transplant Rates (per Active Patient-Year) by Candidate Time on Dialysis



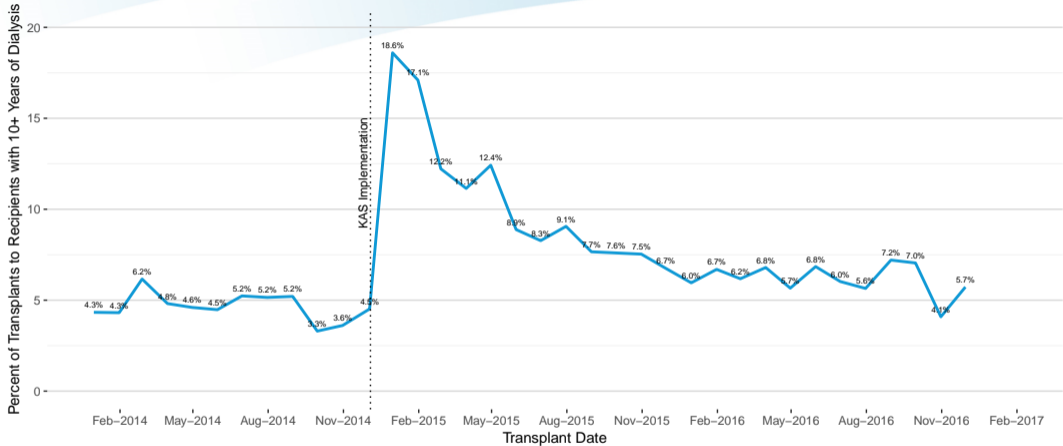
Post-KAS Year 2, transplant rates to candidates with 10+ years of dialysis decreased significantly. All other dialysis groups increased significantly.

Rates of Receiving/Accepting Offers by Candidate Time on Dialysis



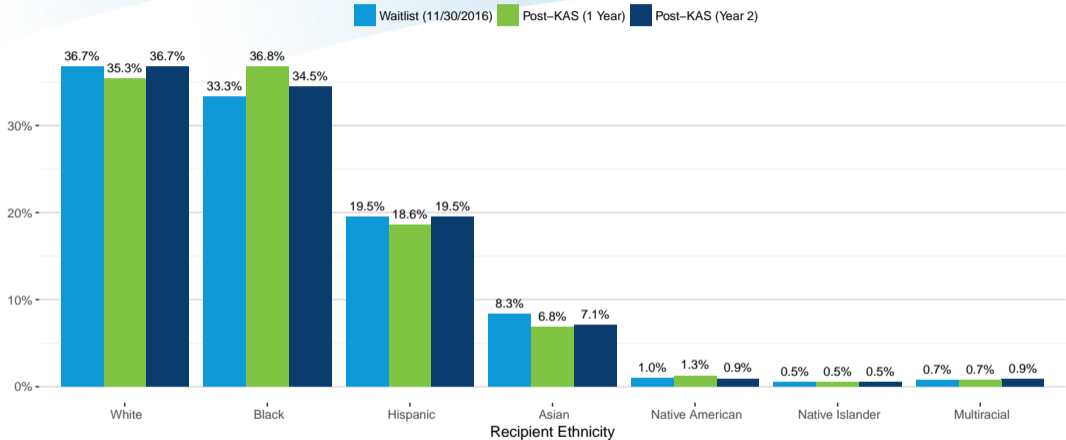
Offer rates decreased Post-KAS Year 2 vs. Year 1 for patients with 10+ years of dialysis. Offer acceptance rates increase as candidate dialysis time increases.

High Dialysis Time Recipient “Bolus Effect”



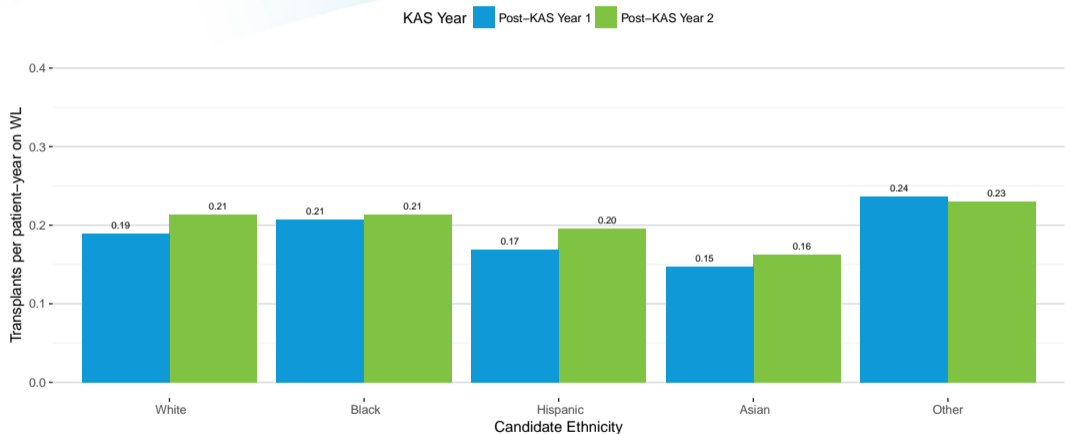
Transplants to candidates with 10+ years of dialysis rose sharply after KAS but have tapered substantially to around 6%.

Deceased Donor Transplants by Recipient Ethnicity



Transplant proportions by ethnicity are reflective of waiting list percentage for most groups.

Transplant Rates (per Active Patient-Year) by Candidate Ethnicity



Transplant rates were approximately the same or higher across all ethnicity groups.

A2/A2B Subtype to Blood Type B Recipients

KAS Year	# A2/A2B to B Transplants	% of Transplants
Pre-KAS	19	0.2%
Post-KAS Year 1	109	1.0%
Post-KAS Year 2	168	1.4%

A2/A2B to B transplants continue to slowly increase under KAS.

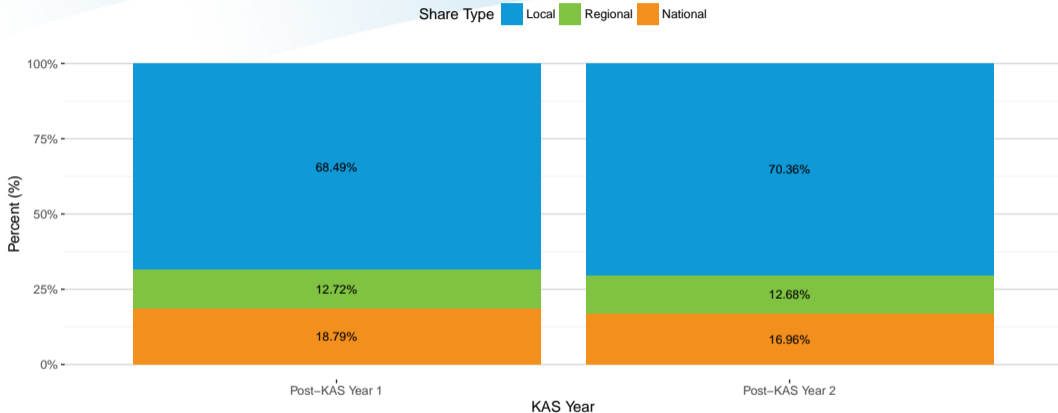
Other Noteworthy Transplant Findings

- Transplants involving KDPI 86-100% donor kidneys has decreased from 8.6% pre-KAS to 7.5% Year 1 and 7.7% Year 2 post-KAS
 - Transplants involving KDPI 21-34% donor kidneys has increased from 15.7% pre-KAS to 16.0% Year 1 and 17.2% Year 2 post-KAS
- The percent of deceased donor kidney alone transplants receiving a repeat transplant has increased under KAS, though decreased from Year 1 to Year 2 post-KAS
 - Pre-KAS: 12.2%, Post-KAS Year 1: 15.8%, Post-KAS Year 2: 14.1%
- The number of dual deceased donor kidney transplants continues to remain lower post- vs. pre-KAS
 - Pre-KAS: 0.9%, Post-KAS Year 1: 0.6%, Post-KAS Year 2: 0.5%

Other Noteworthy Transplant Findings

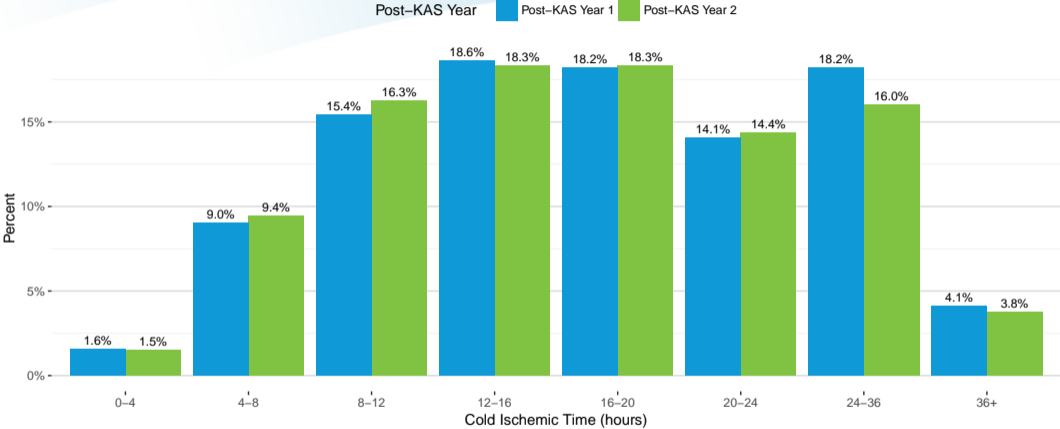
- Transplant percentages by ethnicity reflect waiting list percentages
- The distribution of transplants by recipient ABO has changed little
- The proportion of transplanted deceased donor kidneys used in multi-organ transplants has changed little
 - Pre-KAS: 11.2%, Post-KAS Year 1: 11.7%, Post-KAS Year 2: 11.7%
 - Less than 2% of multi-organ transplants were KDPI 86-100% in either post-KAS year, while nearly 50% were KDPI 0-20%
- Longevity matching continues to be a success, with over half (56%) of EPTS 0-20% adult recipients receiving KDPI 0-20% kidneys, while only 1% received a KDPI 86-100% kidney

Geographic Distribution of Kidney Transplants



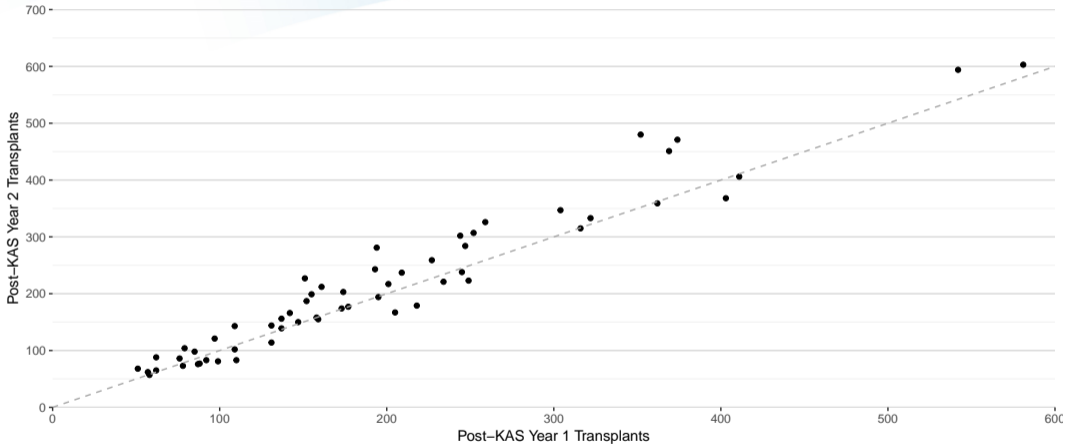
The percent of all deceased donor kidney alone transplants going regionally or nationally (non-local) remained stable post-KAS from 31.6% post-KAS Year 1 to 29.6% post-KAS Year 2.

Cold Ischemic Time



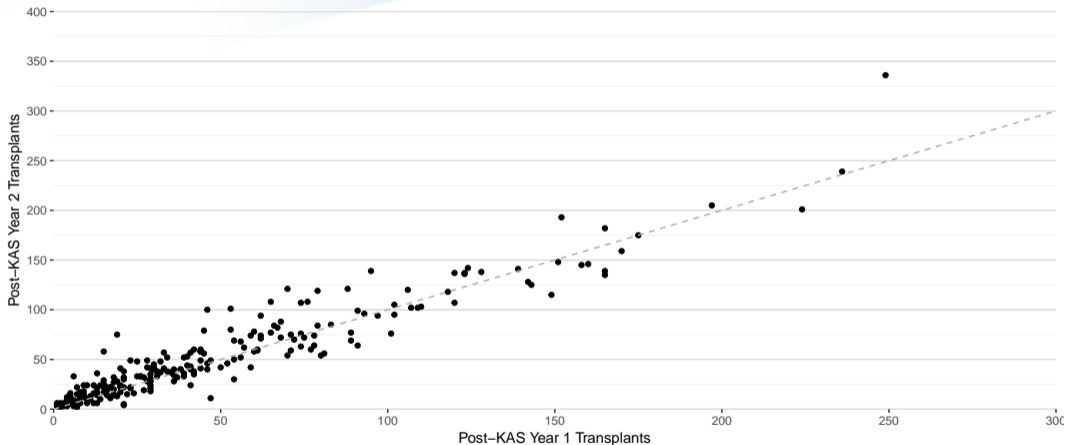
CIT 24+ hours tapered slightly in the 2nd year from 18.9% pre-KAS to 22.4% post-KAS Year 1 to 19.8% post-KAS Year 2.

Solitary Deceased Donor Kidney Transplant Volume by DSA



Similar to pre-KAS vs. post-KAS Year 1, 36 (62%) of 58 DSAs had an increase in volume post-KAS Year 2 vs. post-KAS Year 1.

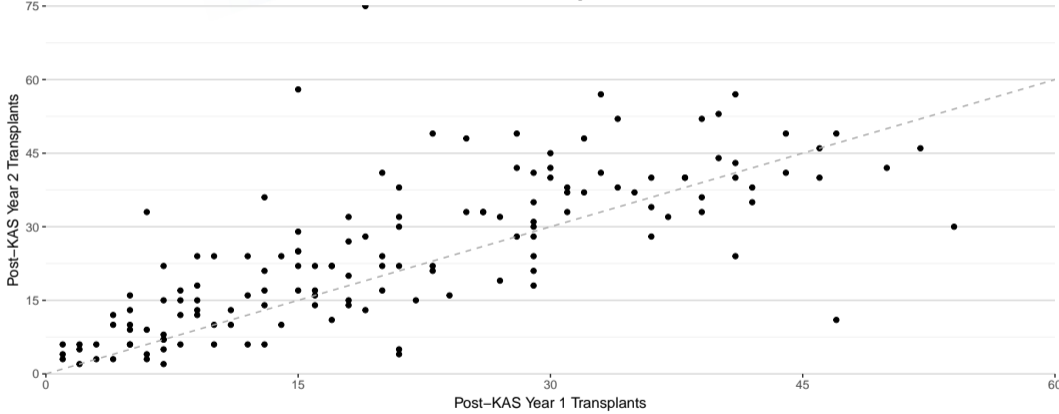
Solitary Deceased Donor Kidney Transplant Volume by Center



Of 235 programs that performed transplants post-KAS Year 1, 146 (62%) had an increase in volume post-KAS Year 2 vs. post-KAS Year 1.

Solitary Deceased Donor Kidney Transplant Volume by Center

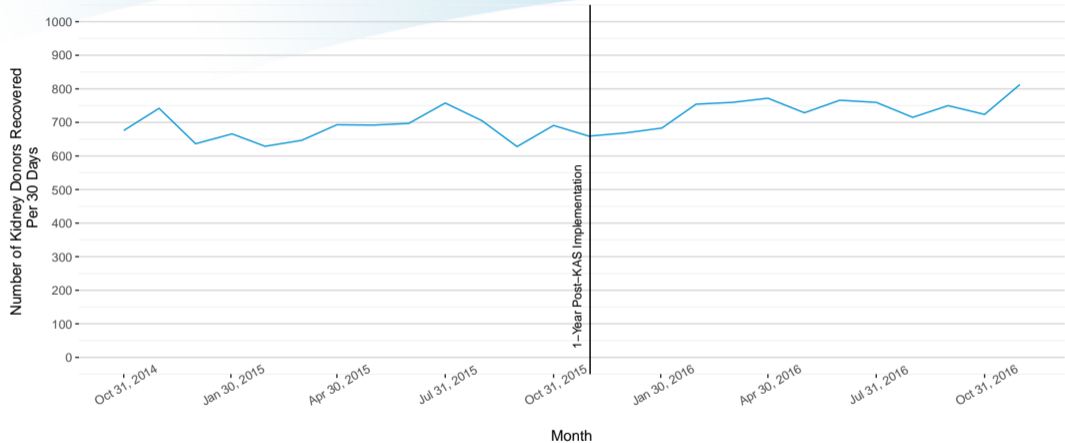
Small Volume Centers: < 100 Transplants in Two Years Post-KAS



Substantial variability post-KAS Year 1 vs. Year 2 variability among small programs.

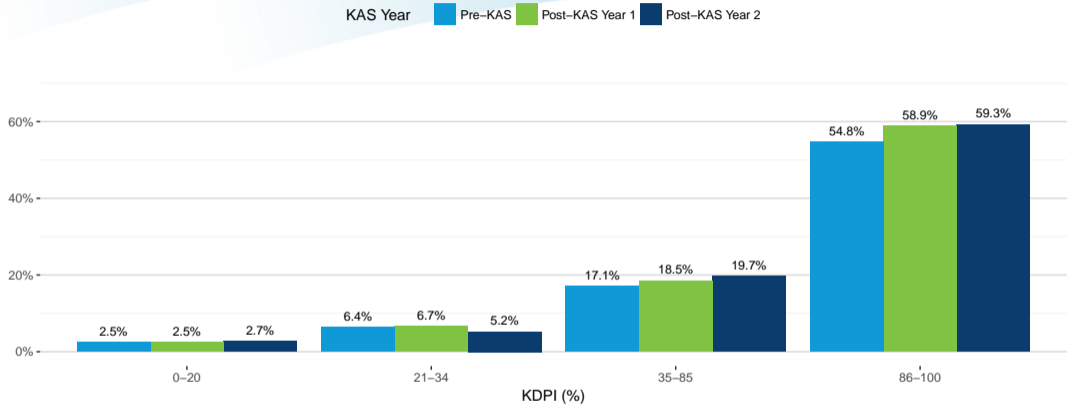
Deceased Donor Kidney Recovery and Utilization

Solitary Deceased Kidney Donors Recovered Under KAS



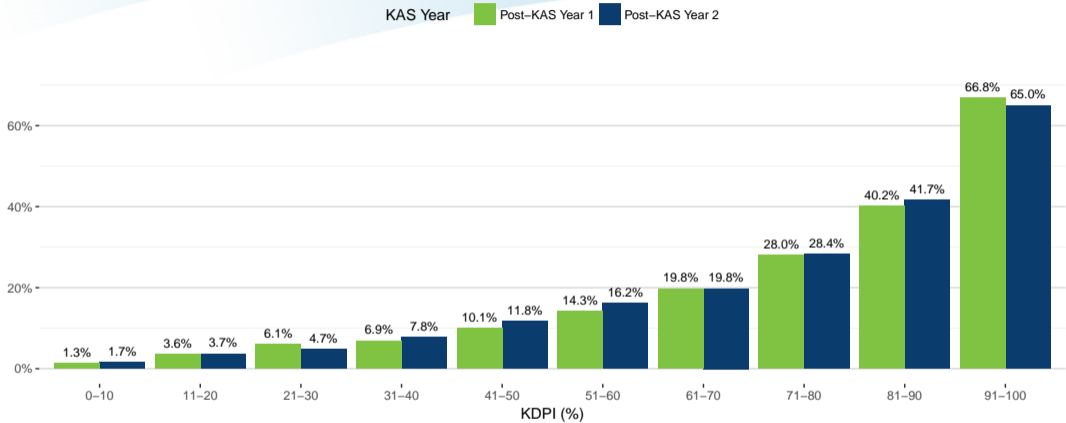
Recovered kidney donor volume increased 9.8% post-KAS, from 8,221 Post-KAS Year 1 to 9,026 Post-KAS Year 2.

Kidney Discard Rate by KDPI



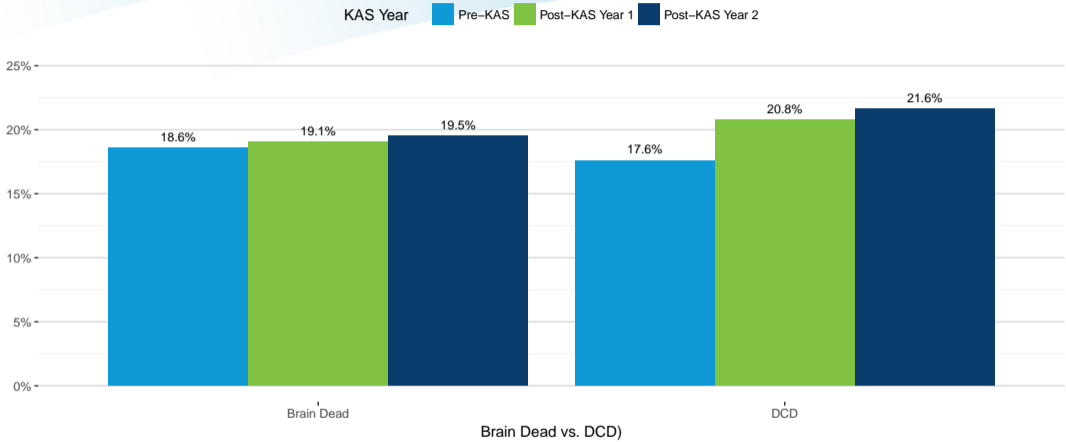
The overall discard rate increased from 19.3% post-KAS Year 1 to 19.9% post-KAS Year 2. KDPI 21-34% kidneys saw a decrease in discard rate in the most recent year, while KDPI 35-85% kidneys discard rates increased again. KDPI 0-20% and 86-100% remain fairly stable in the post-KAS era.

Kidney Discard Rate by KDPI



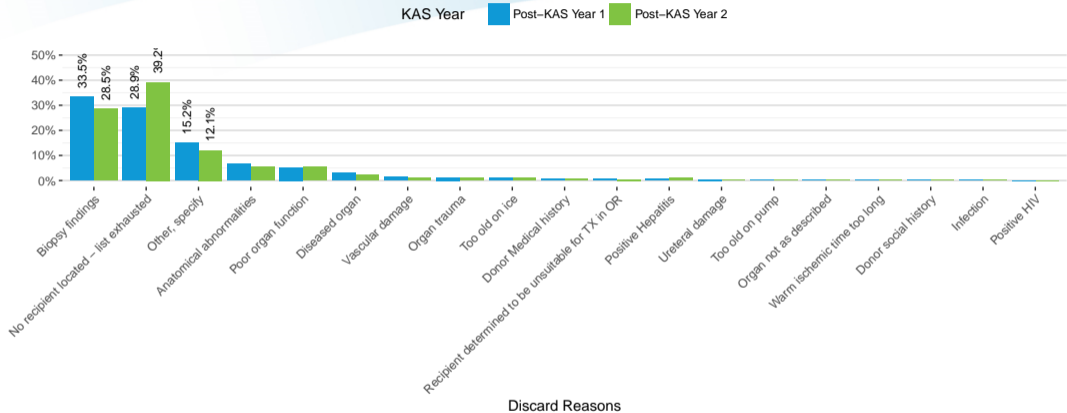
Looking at a finer breakdown of KDPI, for the most part, as KDPI increases, discard rates increase. Discard rates for 21–30% and 91–100% KDPI kidneys decreased in the 2nd year post-KAS. Pre-KAS KDPI data presented in the 1-year report were not this granular.

Kidney Discard Rate by DCD vs. Brain Dead



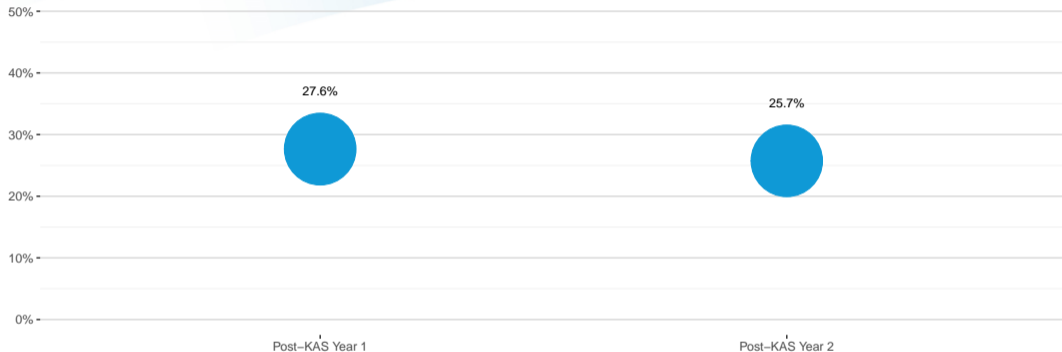
While the discard rate continues to increase overall, the increase was larger for DCD donor kidneys vs. Brain Dead donor kidneys.

Kidney Discard Reasons



Reasons for discard are mostly similar post-KAS Year 2 vs. Year 1. However, there was an obvious increase in list exhaustion and a subsequent decrease in biopsy findings and other.

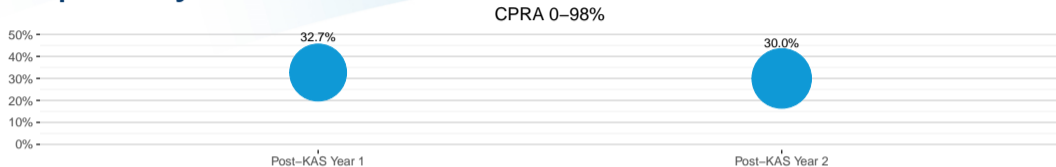
Percent of Offers Accepted Non-Locally Not Going to Acceptor



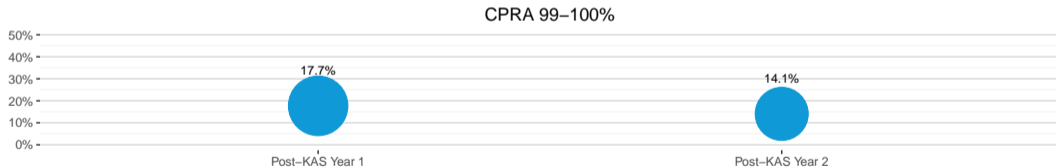
Slight decrease in number of non-local acceptances (size of bubble; 4,923 to 4,896) and percent of kidneys not transplanted to these acceptors (27.6% to 25.7%) post-KAS Year 1 to Year 2. For reference, pre-KAS was 31.9%. Seven programs accounted for 61% of cases Year 1 and these same programs accounted for 54% of cases Year 2.

Overall, there's been an increase in transplants going to the acceptor.

Percent of Offers Accepted Non-Locally Not Going to Acceptor by CPRA

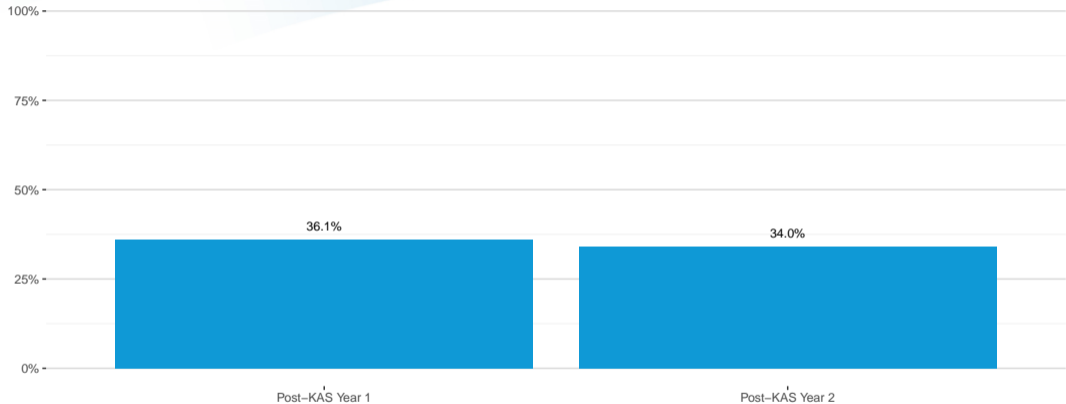


CPRA 0–98%: increase in number of non-local acceptances (size of bubble; 3,268 to 3,587) but decrease in percent of kidneys not transplanted to these acceptors (32.7% to 30.0%) post-KAS Year 1 to Year 2. For reference, pre-KAS was 32.0%.



CPRA 99–100%: decrease in number of non-local acceptances (size of bubble; 1,655 to 1,309) and percent of kidneys not transplanted to these acceptors (17.7% to 14.1%) post-KAS Year 1 to Year 2. For reference, pre-KAS was 29.3%.

Percent of Offers Accepted Non-Locally Not Transplanted to the Acceptor that were Discarded



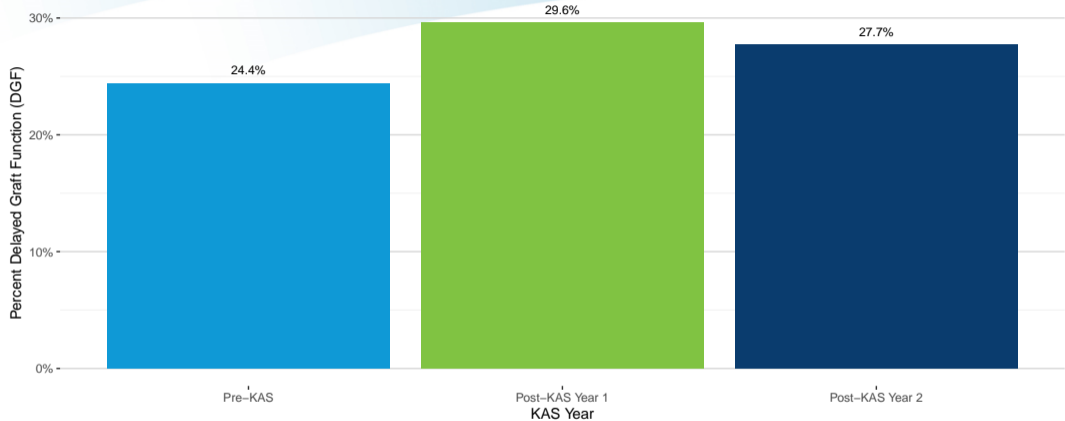
Just over a third of kidneys accepted but not transplanted to the accepting patient were discarded both years post-KAS; the remaining two-thirds were transplanted into another recipient. This holds steady versus pre-KAS.

Other Noteworthy Utilization Findings

- Similarly to pre-KAS vs. post-KAS Year 1, the distribution of donors recovered by KDPI has remained similar post-KAS Year 2.
- The percent of discarded kidneys that were pumped increased from 24.7% post-KAS Year 1 to 28.4% post-KAS Year 2

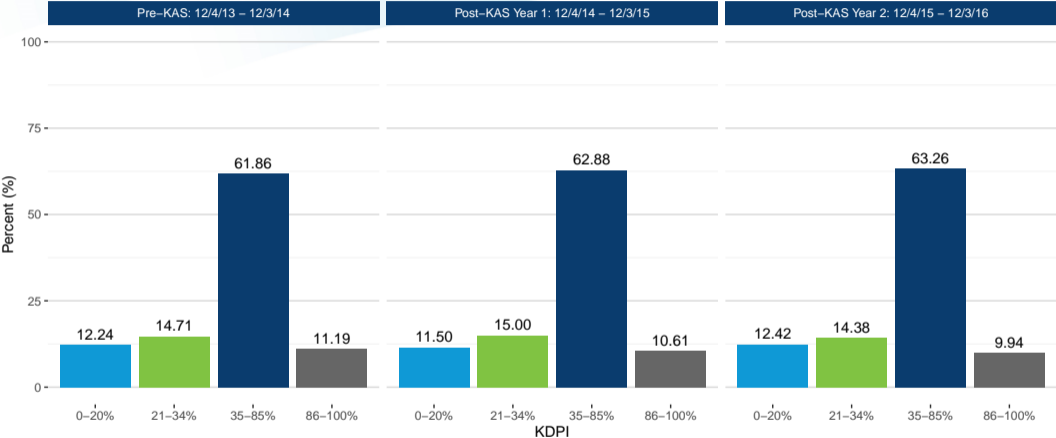
Recipient Outcomes

Delayed Graft Function (DGF) Rates



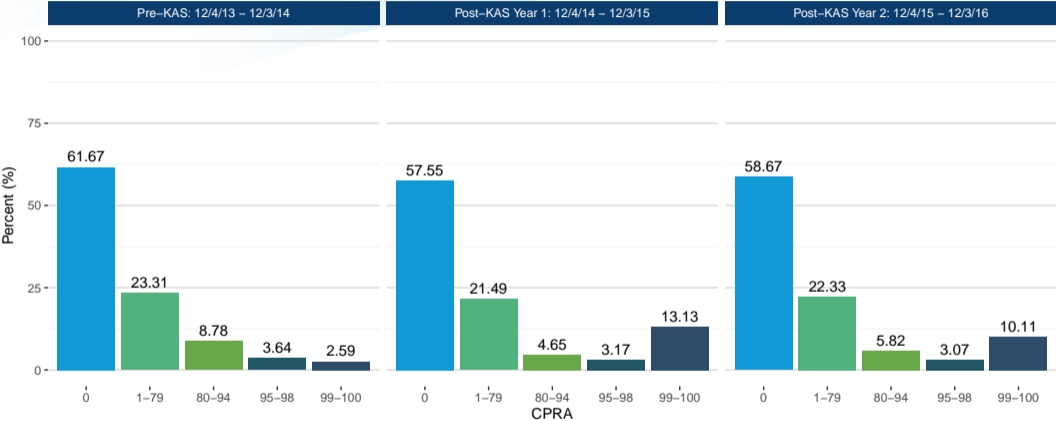
The percentage of recipients requiring dialysis within the first week after transplant decreased from 29.6% post-KAS Year 1 to 27.7% post-KAS Year 2, but remains higher than pre-KAS. The decrease was significant ($p = 0.0010$).

Characteristics of Recipients with DGF



The majority of recipients with DGF received KDPI 35-85% kidneys.

Characteristics of Recipients with DGF

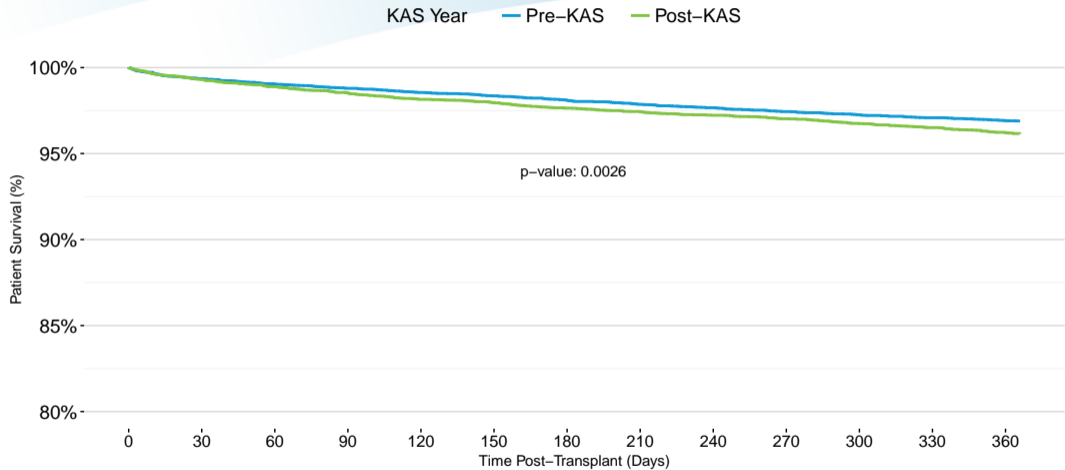


Of recipients with DGF, there was an increase with KAS of CPRA 99-100% patients, but this dropped some in Year 2. The majority of recipients with DGF were not highly sensitized.

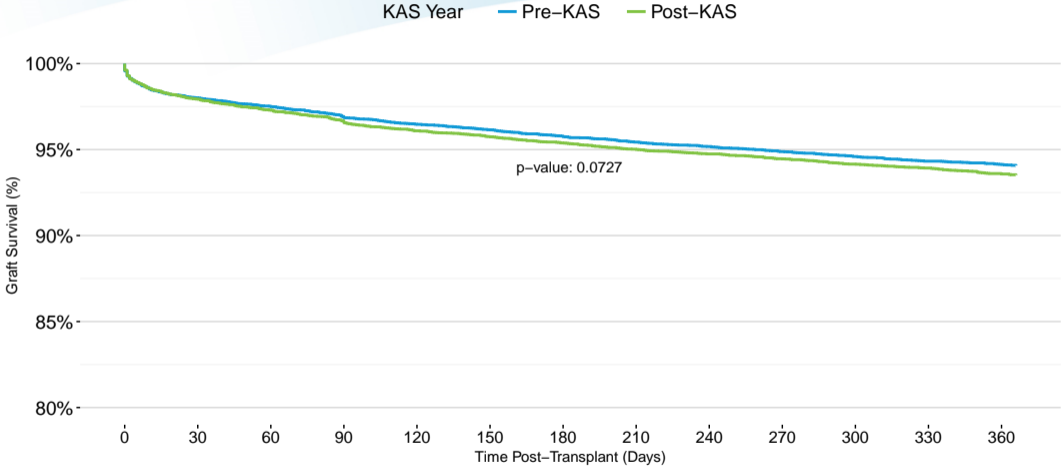
Other Noteworthy DGF Findings

- DGF rates decreased for all levels of KDPI, CPRA, and dialysis time.
- The DGF rate increases markedly as time on dialysis increases. Under KAS, many more patients with higher dialysis times are being transplanted.
- Similarly, DGF rates markedly increase as CIT increases.
- DGF rates decreased regardless of share type or pumping status.
- Among those with DGF:
 - There was little change in most donor, recipient, or transplant characteristics examined pre-KAS to post-KAS Year 2
 - Donor terminal creatinine remained stable at 1.00 across all three years.
 - The majority of those with DGF were KDPI 35-85%, Brain Dead, 5-<10 years dialysis, CPRA 0%, Diabetic or Hypertensive Nephrosclerotic, 12-24 hours of CIT, or local.
 - Recipients with DGF were approximately 50% each for kidneys pumped vs. not pumped.

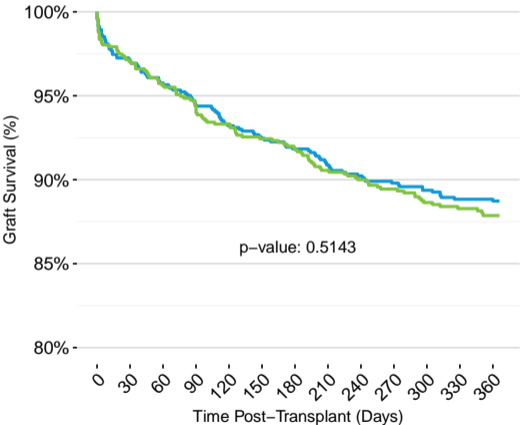
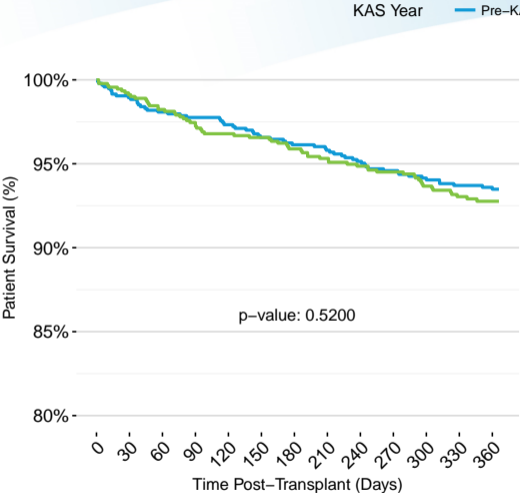
Patient Survival - Overall



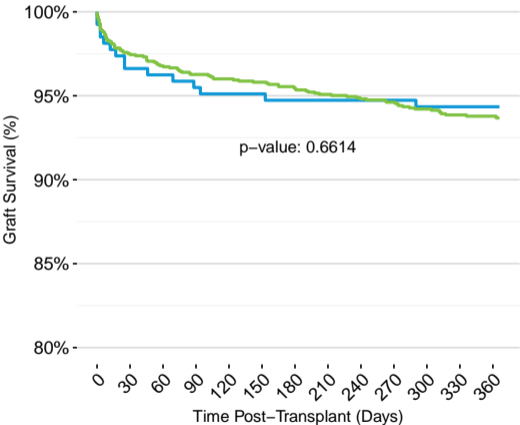
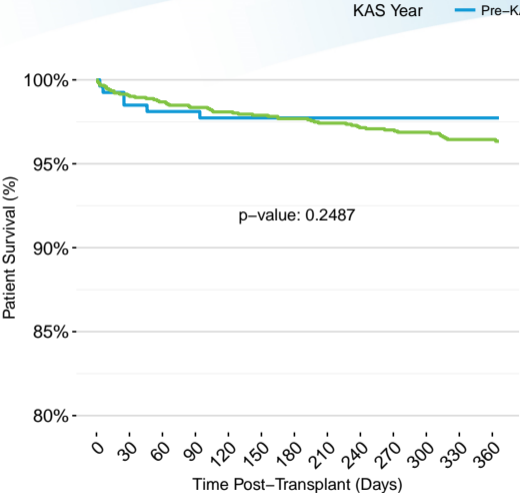
Graft Survival - Overall



Survival - KDPI > 85%

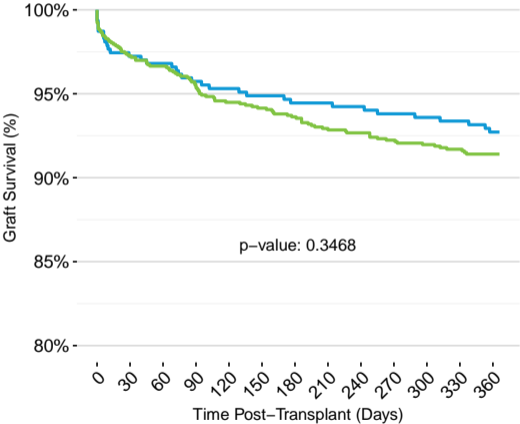
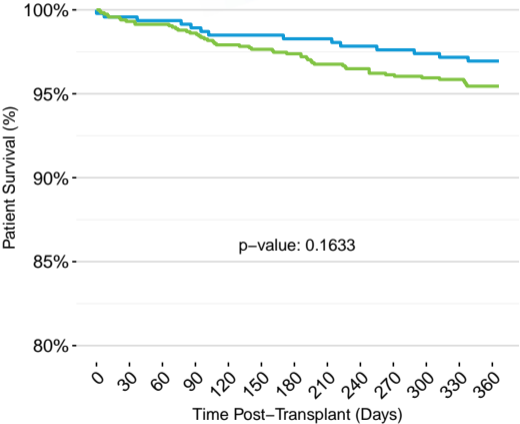


Survival - CPRA 99-100%

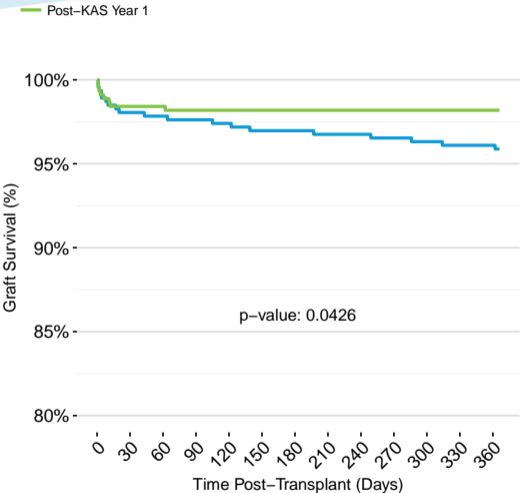
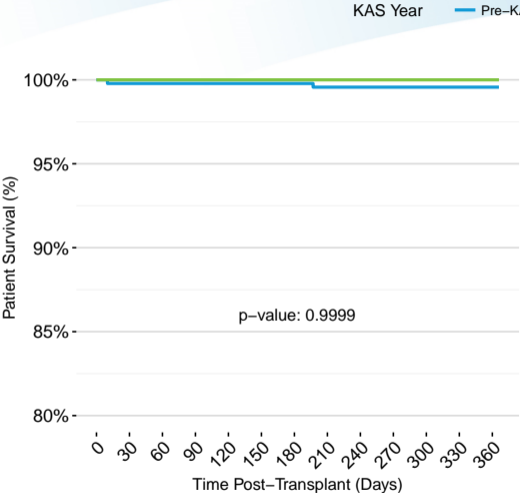


Survival - Dialysis 10+ Years

KAS Year Pre-KAS Post-KAS Year 1

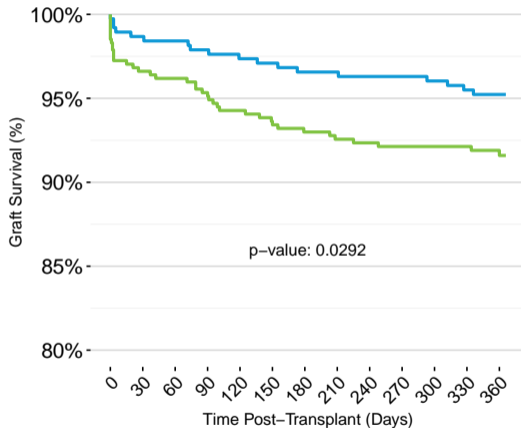
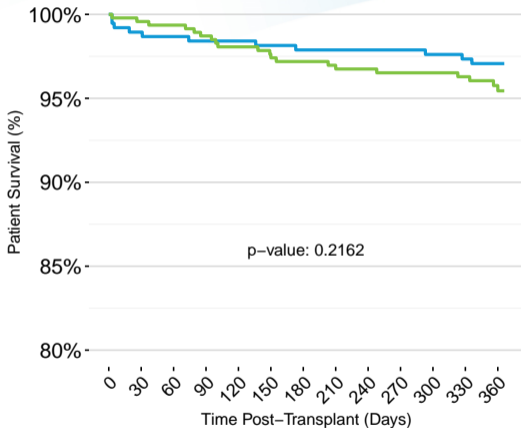


Survival - Pediatrics



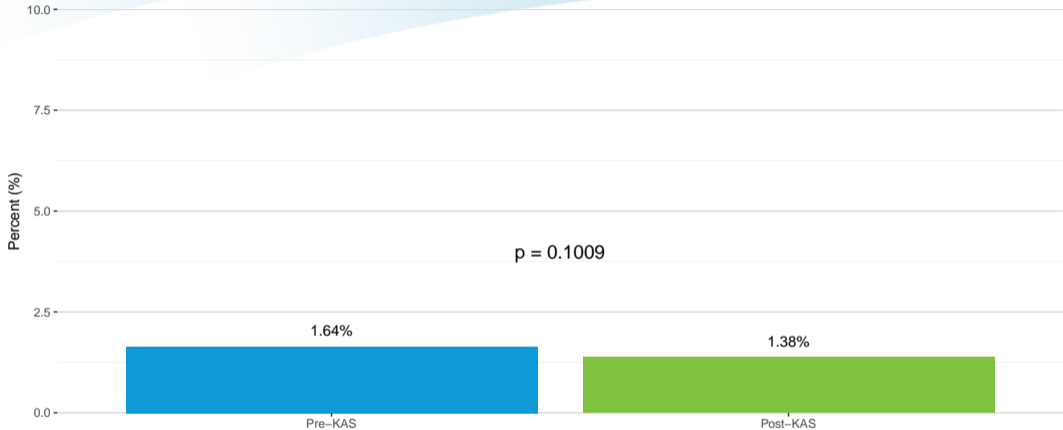
Survival - CIT 36+ Hours

KAS Year — Pre-KAS — Post-KAS



This drop may taper at two years given that CIT is decreasing as centers are adjusting to the system.

Relisting Rates Within One Year of Transplant



Relisting rates within one year of transplant decreased from 1.64% to 1.38%, but this was not a significant change ($p = 0.1009$).

Other Noteworthy Outcomes Findings

- One-year Serum Creatinine increase was significant (1.27 to 1.30) post-KAS Year 1 to Year 2.
- One-year eGFR increase was not significant (61.0 to 61.1) post-KAS Year 1 to Year 2.

Thank You!

UNOS Research Department

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