The Kidney Allocation System (KAS)

The First Two Years

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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
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

Preemptive listings are still increasing. Candidates with longer dialysis time decreased with subsequent increases for candidates with 1–3 years.

Preemptive <1 year 1–5 years 5–10 years 10+ years

Percent Change: Post−KAS Year 2 vs. Post−KAS Year 1

- 2.44%
- 4.26%
3.66%
- 2.06%
- 0.17%
- 5.0
- 2.5
0.0
2.5
5.0

Time on Dialysis

Pre–emptive listings are still increasing. Candidates with longer dialysis time decreased with subsequent increases for candidates with 1–3 years.
As of 11/30/16, 4.5% of blood type B registrations on the WL were indicated as eligible for A2/A2B kidneys.
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 had no significant changes post-KAS Year 2 vs. Year 1.
Waiting list mortality rates have remained virtually unchanged. Region 4 had the only significant change, decreasing post–KAS Year 2 vs. Year 1.
The number and percent of candidates listed as active and remaining active at 60 days post–listing has been increasing.
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.
The percent of transplants to younger candidates (18–49) decreased slightly, and transplants to 50+ candidates increased slightly.
Transplant rates were higher overall, as well as for almost every age group. The slight decrease for ages 6–10 was not significant.
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.
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.
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.
Offer rates increased for all CPRA groups except the very highly sensitized candidates.
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.
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.
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

<table>
<thead>
<tr>
<th>KAS Year</th>
<th># A2/A2B to B Transplants</th>
<th>% of Transplants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-KAS</td>
<td>19</td>
<td>0.2%</td>
</tr>
<tr>
<td>Post-KAS Year 1</td>
<td>109</td>
<td>1.0%</td>
</tr>
<tr>
<td>Post-KAS Year 2</td>
<td>168</td>
<td>1.4%</td>
</tr>
</tbody>
</table>

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
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.
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.
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.
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.
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
Recovered kidney donor volume increased 9.8% post–KAS, from 8,221 Post–KAS Year 1 to 9,026 Post–KAS Year 2.
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.
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.
While the discard rate continues to increase overall, the increase was larger for DCD donor kidneys vs. Brain Dead donor kidneys.
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.
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%

- Pre-KAS Year 1: 32.7%
- Pre-KAS Year 2: 30.0%

CPRA 99–100%

- Pre-KAS Year 1: 17.7%
- Pre-KAS Year 2: 14.1%

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

KAS Year

Pre–KAS

Post–KAS

p–value: 0.0026
Graft Survival - Overall

KAS Year

Pre–KAS

Post–KAS

p–value: 0.0727
Survival - KDPI > 85%

KAS Year | Pre-KAS | Post-KAS Year 1
---|---|---
p-value: 0.5200

Patient Survival (%)

Graft Survival (%)

p-value: 0.5200

55
Survival - CPRA 99-100%

KAS Year
Pre-KAS
Post-KAS Year 1

p-value: 0.2487

```
80%
85%
90%
95%
100%
0 30 60 90 120 150 180 210 240 270 300 330 360
Time Post-Transplant (Days)
Patient Survival (%)
```

```
56
```

```
100%
95%
90%
85%
80%
0 30 60 90 120 150 180 210 240 270 300 330 360
Time Post-Transplant (Days)
Graft Survival (%)
```

p-value: 0.6614
Survival - Dialysis 10+ Years

KAS Year

Pre−KAS

Post−KAS Year 1

p−value: 0.1633

80%

85%

90%

95%

100%

0 30 60 90 120 150 180 210 240 270 300 330 360

Time Post−Transplant (Days)

Patient Survival (%)

p−value: 0.3468

80%

85%

90%

95%

100%

0 30 60 90 120 150 180 210 240 270 300 330 360

Time Post−Transplant (Days)

Graft Survival (%)

p−value: 0.3468

57
Survival - Pediatrics

KAS Year     Pre-KAS    Post-KAS Year 1

p-value: 0.9999

80%
85%
90%
95%
100%

0 30 60 90 120 150 180 210 240 270 300 330 360
Time Post–Transplant (Days)

Graft Survival (%)

p-value: 0.0426

80%
85%
90%
95%
100%

0 30 60 90 120 150 180 210 240 270 300 330 360
Time Post–Transplant (Days)

Patient Survival (%)
Survival - CIT 36+ Hours

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 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!
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