Increasing Access to Kidney Transplantation

Image courtesy of Vic Kulihin
Objectives and Overview

- Review kidney transplantation and discuss the need to increase transplantation rates
- Compare transplantation of high-Kidney Donor Profile Index (KDPI) kidneys to remaining on dialysis and waiting for low-KDPI kidneys
- Discuss transplantation with underutilized sources of deceased donor (DD) kidneys
- Examine available strategies to increase the living donor (LD) kidney pool, including improving risk prediction and increasing access through kidney-paired donation (KPD)
- Discuss programs and resources designed to increase transplant knowledge and access through patient and caregiver education
The Growing Need for Kidney Transplantation
Kidney Transplantation Has Been Shown to Improve Patient Outcomes

- Benefits of kidney transplantation over dialysis

<table>
<thead>
<tr>
<th>Dialysis</th>
<th>Transplant</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>🔺</td>
</tr>
<tr>
<td></td>
<td>🔺</td>
</tr>
<tr>
<td></td>
<td>🔺</td>
</tr>
</tbody>
</table>

- Significantly lower mortality rates in most studies\(^1\)
- Significantly higher quality of life\(^1\)
- Improved outcomes regardless of recipient age or underlying comorbidities\(^2\)

Patients who receive a deceased donor kidney transplant are projected to live an average of 10 years longer than those who remain on dialysis\(^3\)

Despite Positive Trends, There Continues to Be a Gap Between Supply and Demand

- Kidney transplants rose in 2016 due to an increase in DD transplants, though LD transplants have declined since 2004
- The number of candidates on the inactive waiting list decreased in 2016, while the active list continues to be problematic
- By the end of 2016, 95,456 patients remained on the waiting list

<table>
<thead>
<tr>
<th>Year</th>
<th>Candidates (in thousands)</th>
<th>Transplants (in thousands)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
<td>20</td>
<td>10</td>
</tr>
<tr>
<td>2005</td>
<td>15</td>
<td>8</td>
</tr>
<tr>
<td>2006</td>
<td>10</td>
<td>5</td>
</tr>
<tr>
<td>2007</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>2008</td>
<td>10</td>
<td>5</td>
</tr>
<tr>
<td>2009</td>
<td>15</td>
<td>8</td>
</tr>
<tr>
<td>2010</td>
<td>20</td>
<td>10</td>
</tr>
<tr>
<td>2011</td>
<td>25</td>
<td>12</td>
</tr>
<tr>
<td>2012</td>
<td>30</td>
<td>14</td>
</tr>
<tr>
<td>2013</td>
<td>35</td>
<td>16</td>
</tr>
<tr>
<td>2014</td>
<td>40</td>
<td>18</td>
</tr>
<tr>
<td>2015</td>
<td>45</td>
<td>20</td>
</tr>
<tr>
<td>2016</td>
<td>50</td>
<td>22</td>
</tr>
</tbody>
</table>


DD, deceased donor; LD, living donor.
Waiting List Times Remain Long and May Be Associated With Poor Outcomes

- More than 40% of adults listed in 2013 were still waiting for a transplant 3 years later (2016)
- In 2016, more than 20% of waiting list candidates had been on dialysis for at least 6 years

In 2016, more than 25% of adult patients were removed from the kidney transplant list due to death or deteriorating medical conditions, reflecting the ongoing organ shortage


Access to Kidney Transplantation

- Strategies to increase transplantation rates may utilize both deceased and living donor kidneys

Deceased Donor Transplantation
Growing High-KDPI Transplantation Rates
Donor Kidneys Are Risk-Stratified Using KDPI\(^1\)

- In the current KAS, KDPI replaced SCD/ECD terminology and provides increased precision in determining organ quality\(^2\)
- KDPI is a measure of relative risk derived from the Kidney Donor Risk Index on a cumulative percentage scale\(^2\)
- KPDI is calculated using 10 donor criteria, which are weighted differently\(^2\)
  - Age
  - Height
  - Weight
  - Ethnicity
  - History of hypertension
  - History of diabetes
  - Cause of death
  - Serum creatinine
  - Hepatitis C virus (HCV) status
  - Donation after circulatory death

![Graft Survival and Discard Rates by KDPI\(^3,4\)](image)

A lower KDPI is associated with better posttransplant graft survival\(^2\)

---

ECD, expanded criteria donor; KAS, kidney allocation system; SCD, standard criteria donor.

About Half of Recovered High-KDPI Kidneys Are Discarded\textsuperscript{1}

- In 2017, 1,652 kidneys with a KDPI 86%-100% were discarded\textsuperscript{2}

- The willingness to accept an ECD or high-KDPI kidney has continued to decrease since 2014\textsuperscript{1}

**Rates of Kidneys Recovered for Transplant and Not Transplanted\textsuperscript{1}**

**Percentage of Patients Willing to Accept ECD or KDPI >85% Kidney\textsuperscript{1}**

High-KDPI score alone should rarely disqualify a potential donor kidney from consideration\textsuperscript{3}

---

High-KDPI Kidneys Offered a Survival Advantage Compared With Remaining on the Waiting List

- A retrospective study examined outcomes associated with accepting a >70 KDPI kidney vs remaining on the waiting list for a ≤70 KDPI kidney
- Patients who received a transplant with a >70 KDPI kidney had a 6-month period of higher mortality risk followed by an extended period of lower mortality risk compared with those who waited for a lower-KDPI kidney and remained on dialysis (n=50,708)

Relative Survival
High-KDPI KT vs Waiting for a Lower-KDPI Kidney

KT, kidney transplant.
The Benefit of High-KDPI Kidneys Depends on Patient Characteristics

- The highest-risk kidneys were a benefit for patients older than 50 years at centers with waiting times of ≥33 months

### Decision Tree for Acceptance of High-KDPI Organ Offers

1. **KDPI 91-100**
   - **Age > 50 years?**
     - **Yes**
       - **Center wait time ≥33 months?**
         - **No**
           - **Diabetic?**
             - **No**
               - Harm
             - **Yes**
               - Equipoise
         - **Yes**
           - **Center wait time ≥33 months?**
             - **No**
               - Harm
             - **Yes**
               - Benefit


High-KDPI kidneys may offer a benefit to appropriate patients
High-Risk Kidneys Did Not Negatively Affect Program Reports

Transplantation of High-KDPI Kidneys Did Not Affect the HR for a Program’s Graft Survival\(^1\)

Low-Performance Flags Lead to Reductions in Transplant Volume\(^2\)

There is no evidence that changing volume will improve center performance. Centers should ensure that high-risk patients have access to transplant despite low-performance concerns\(^2\)

HR, hazard ratio.

\(^P\) value reflects test for change in volume between centers with and without low-performance evaluations.

Deceased Donor Transplantation

Increasing Access to Underutilized Donor Sources
U.S. Public Health Service Guideline for Infectious Risk Kidneys

- PHS categorizes some donors as at increased risk for disease transmission (IRD)\(^1,2\)
- The PHS guidelines include risk of HIV, HBV, and HCV\(^2\)

**The Percentage of Donor Kidneys Classified as IRD Is Rising\(^1\)**
- 12.3% of kidneys (2/1/2013-7/1/2013)
- 19.5% of kidneys (2/1/2014-7/1/2014)

- The exact reasons for these increases are unknown but may be related to the opioid epidemic\(^3\)

**Risk Factors Associated With IRD\(^2,*\)**
- Sex with a person known or suspected to have HIV, HBV, or HCV infection
- Men who have had sex with men (MSM)
- Sex with a man with a history of MSM behavior
- Sex in exchange for money or drugs
- Sex with a person who has had sex in exchange for money or drugs
- Sex with a person who has injected drugs by intravenous, intramuscular, or subcutaneous route for nonmedical reasons
- Use of injected drugs by intravenous, intramuscular, or subcutaneous route for nonmedical reasons
- Lockup, jail, prison, or a juvenile correctional facility for more than 72 consecutive hours
- Diagnosis with, or treatment for, syphilis, gonorrhea, chlamydia, or genital ulcers

HBV, hepatitis B virus; PHS, U.S. Public Health Service.
*Within the preceding 12 months.
Opioid Epidemic: Impact on Kidney Transplant

- Opioids were involved in 42,249 deaths in 2016, and opioid overdose deaths were 5 times higher in 2016 than in 1999.

- PHS guidelines classify organs from individuals who use opioid for nonmedical reasons as at increased risk for infection with HIV, HBV, and HCV.

- However, the risk of HIV or HCV transmission from a NAT-negative donor organ from an injection drug user is <1%.

The risks of using donor kidneys from opioid users should be considered along with the benefits for appropriate patients.

NAT, nucleic acid testing.
Transplantation of Infectious Risk Kidneys

- Discard rates of IRD kidneys were higher than their non-IRD counterparts, despite potential benefit in some patient populations\(^1,2\)

- 5 years after declining an IRD kidney offer\(^2\)
  - 39.5\% of patients had died or had been removed from the waiting list
  - 31\% of patients had received a non-IRD DD kidney transplant

- Patients declined an IRD kidney with a median KDPI of 21 and accepted a non-IRD kidney with a median KDPI of 52\(^2\)

**Patient Mortality Among Those Who Accepted vs Declined the IRD Kidney Offer\(^2\)**

Education on the risks and benefits can help increase utilization of IRD kidneys in appropriate patients\(^2\)

---


© John Wiley and Sons.
A Prediction Model for IRD Kidneys

- A Markov decision process model was designed to predict survival associated with accepting an IRD kidney vs declining an IRD kidney and remaining on dialysis based on patient characteristics.

- A functional implementation of this model can be found at http://transplantmodels.com/ird

**Predicted Survival After Accepting or Declining IRD Kidneys**

- **40F, 3 Months Until Non-IRD Transplant**
  - Accept IRD (base-case): 93%
  - Accept IRD (worst-case): 92%
  - Decline IRD: 90%

- **65F, Diabetic, 60 Months to Non-IRD Transplant**
  - Accept IRD (base-case): 69%
  - Accept IRD (worst-case): 67%
  - Decline IRD: 33%


Direct-Acting Antivirals Have Changed the Utilization of HCV+ Kidneys

• The development of DAAs and the subsequent reduction of interferon-based regimens have resulted in a well-tolerated and efficacious treatment for HCV1,2

• The open-label, single-center THINKER trial found that transplant of HCV+ kidneys into HCV recipients, followed by the use of DAAs, provided excellent allograft function with a cure of HCV infection3,*

• Durand et al also showed that pretransplant and posttransplant HCV treatment was safe and prevented chronic HCV infection in HCV D+/R- kidney transplant4

HCV RNA Was Not Detected in HCV D+/R- Kidney Transplant Recipients After Treatment4

D+, donor positive; DAAs, direct-acting antiviral agents; FW, follow-up week; POD, postoperative day; R-, recipient negative; TW, treatment week.

*A cure was defined as a sustained virologic response 12 weeks after the end of treatment.

Increasing Access to HIV+ Kidneys

- Patients with HIV have similar graft failure rates to patients without HIV\(^1\)
- Transplant between HIV\(^+\) recipient/donor pairs has been conducted in South Africa but was not allowed in the United States prior to 2013\(^1,2\)
- The HOPE Act was passed in 2013 and allowed HIV\(^+\) kidneys to be transplanted into HIV\(^+\) patients\(^2\)
- The first HIV\(^+\) to HIV\(^+\) transplant in the United States took place in 2016\(^3\)
- As of November 2017, 22 transplant centers were approved to perform HIV\(^+\) to HIV\(^+\) transplants\(^4\)

Patients with HIV can be organ donors or receive a transplant\(^3\)

Living Donor Transplantation
Expanding Donation by Improving Risk Prediction
Living Donation Has Lifetime Implications

- Every year in the United States, approximately 6,000 healthy adults accept the risks of donor nephrectomy to help improve the lives of others\(^1\)
- Donating a kidney is a decision with lifetime implications for the living donor\(^2\)
- Transplant programs should support donor candidates throughout the decision-making process and have a responsibility to ensure that donors are aware of all the potential risks\(^1,2\)
- In 2017, KDIGO published clinical practice guidelines on the evaluation and care of living kidney donors and provided recommendations to assist medical professionals who evaluate living donor candidates\(^2\)

Risk of Developing ESRD in Living Donors

• The most direct effect of living kidney donation is the long-term risk of developing ESRD

• Analysis of national registry data revealed that estimated risk of ESRD in living donors varied according to donor characteristics:
  - Male
  - Black
  - Biologically related to recipient
  - High BMI

<table>
<thead>
<tr>
<th></th>
<th>ESRD per 10,000</th>
<th><em>P</em> Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Living donors</td>
<td>90</td>
<td>REF</td>
</tr>
<tr>
<td>Unscreened nondonors</td>
<td>326</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Healthy nondonors</td>
<td>14</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

Living donors are at higher risk of ESRD than similarly healthy non-donors but still have a much lower risk than the general population.

Overall, the magnitude of the absolute risk increase of ESRD in living donors was small.

ESRD, end-stage renal disease.
Tool to Help Evaluate Risk of ESRD

- Together KDIGO and CKD-Prognosis Consortium developed an online risk tool to help evaluate, counsel, and accept living kidney donor candidates\(^1,2\)
- The risk of developing ESRD is influenced by a combination of demographic and health characteristics\(^1\)
- The model can be found at [www.transplantmodels.com/esrdrisk]\(^2\)

### Projections of the Incidence of ESRD in the US According to Age, Race, and Sex for the Base-Case Scenario\(^2\)

**15-Year Projected Incidence of ESRD**

<table>
<thead>
<tr>
<th>Age, years</th>
<th>Black men</th>
<th>Black women</th>
<th>White men</th>
<th>White women</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>0.2</td>
<td>0.2</td>
<td>0.1</td>
<td>0.1</td>
</tr>
<tr>
<td>30</td>
<td>0.4</td>
<td>0.4</td>
<td>0.3</td>
<td>0.3</td>
</tr>
<tr>
<td>40</td>
<td>0.6</td>
<td>0.6</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>50</td>
<td>0.8</td>
<td>0.8</td>
<td>0.7</td>
<td>0.7</td>
</tr>
<tr>
<td>60</td>
<td>1.0</td>
<td>1.0</td>
<td>0.9</td>
<td>0.9</td>
</tr>
<tr>
<td>70</td>
<td>1.2</td>
<td>1.2</td>
<td>1.1</td>
<td>1.1</td>
</tr>
<tr>
<td>80</td>
<td>1.4</td>
<td>1.4</td>
<td>1.3</td>
<td>1.3</td>
</tr>
</tbody>
</table>

**Lifetime Projected Incidence of ESRD**

<table>
<thead>
<tr>
<th>Age, years</th>
<th>Black men</th>
<th>Black women</th>
<th>White men</th>
<th>White women</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>0.2</td>
<td>0.2</td>
<td>0.1</td>
<td>0.1</td>
</tr>
<tr>
<td>30</td>
<td>0.4</td>
<td>0.4</td>
<td>0.3</td>
<td>0.3</td>
</tr>
<tr>
<td>40</td>
<td>0.6</td>
<td>0.6</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>50</td>
<td>0.8</td>
<td>0.8</td>
<td>0.7</td>
<td>0.7</td>
</tr>
<tr>
<td>60</td>
<td>1.0</td>
<td>1.0</td>
<td>0.9</td>
<td>0.9</td>
</tr>
<tr>
<td>70</td>
<td>1.2</td>
<td>1.2</td>
<td>1.1</td>
<td>1.1</td>
</tr>
<tr>
<td>80</td>
<td>1.4</td>
<td>1.4</td>
<td>1.3</td>
<td>1.3</td>
</tr>
</tbody>
</table>

*The base-case scenario for the 15-year projected risk is the following: an age-specific eGFR (114, 106, 98, 90, 82, 74, and 66 mL per minute per 1.73 m\(^2\) for an age of 20, 30, 40, 50, 60, 70, and 80 years, respectively), systolic blood pressure of 120 mm Hg, a urinary albumin-to-creatinine ratio of 4, a BMI of 26, and no diabetes mellitus or use of antihypertensive medication.


BMI, body mass index; CKD, chronic kidney disease; eGFR, estimated glomerular filtration rate.

The Living Kidney Donor Profile Index Allows for Comparison of DD and LD Kidneys

- The Living Kidney Donor Profile Index (LKDPI) allows for comparison of all available kidneys and can help ensure that candidates receive the kidney that will provide the greatest benefit.

- Donor factors that affect living donor transplant outcomes, which are weighted differently, include:
  - Age (among donors aged >50 years)
  - Body mass index
  - Race
  - History of cigarette use
  - Systolic blood pressure
  - ABO incompatibility with recipient
  - HLA-B mismatches with recipient
  - HLA-DR mismatches with recipient

Distribution of LKDPI and KDPI

Kidneys From Older Living Donors May Benefit Appropriate Patients

- An analysis of SRTR data evaluated outcomes of patients who underwent transplant with living donor kidneys from donors aged ≥70 years.

- Rates of graft loss were higher than those observed with younger living donors but were not significantly different from outcomes with deceased donors aged 50 to 59 years.

- Appropriately selected donor-recipient pairs may benefit from transplantation of kidneys from living donors of advanced age.

Living Donor Transplantation
Increasing Access Through Kidney Paired Donation (KPD)
**KPD Programs Increased the Rate of Living Donation**

- KPD programs have been predicted to increase the use of LD kidneys in the United States\(^1\)
  - A study of 34,843 LDKTs found that KPD transplants increased from 1.5% of LDKTs in 2006 to 9.9% of LDKTs in 2011\(^2\)
  - A survey of potential living donors found that 64% were very willing to participate in paired donation\(^3\)
    - Significantly more than list exchanges or nondirected donation \(P<0.001\)

---

**KPD Utilization, 2006-2011\(^2\)**

- If all transplant centers perform KPD at the same rates as very high-performing centers, an estimated additional 1099 LDKTs will occur each year\(^2\)

---

LDKT, living donor kidney transplant.
Approaches to KPD Vary Widely

Schematic Representations of Paired Donor Kidney Exchanges


NDD, non-directed donor; NEAD, nonsimultaneous extended altruistic donor.
Potential Advantages of Using Compatible Pairs

- Simulated donors and recipients were used to investigate the impact of including ABO-compatible pairs* in KPD\textsuperscript{1}
- Donors who were ABO-incompatible or crossmatch-incompatible with their intended recipients were included in this analysis\textsuperscript{1}
- Including compatible pairs was predicted to double the match rate of KPD programs\textsuperscript{1}

*Desensitization is not required for compatible pairs.\textsuperscript{2}
KPD Can Be Utilized at All Transplant Centers

Multicenter KPD - Kidney Paired Donation Pilot Program

• The Organ Procurement and Transplantation Network, or OPTN, has developed the Kidney Paired Donation Pilot Program, a national exchange program to facilitate multicenter KPD\(^1\)

• Centers in 40 states and the District of Columbia participate\(^2\)

• Any candidate on the national organ transplant waiting list can join and will remain on the deceased donor waiting list\(^1\)

Single-Center KPD - Methodist Specialty and Transplant Hospital

• In the first 3 years of implementation\(^3\)
  – Performed 134 total KPD transplants (114 with incompatible pairs, 17 with compatible pairs)
  – 36% of KPDs were 2-way exchanges, 36% were 3-way exchanges, and 28% were chain transplants
  – In the third year, KPD accounted for 35% of LDKTs

---


Increasing Transplantation Through Education
UNOS Kidney Transplant Learning Center

- An online national clearinghouse of public educational resources for people living with ESRD, those awaiting a kidney transplant, and potential living donors
- Resources were developed by national leaders in transplant education
- The learning center contains information on
  - Kidney disease and treatment
  - Dialysis
  - Transplant from a deceased donor
  - Transplant from a living donor
  - Finding a living donor
  - Being a living donor


One-of-a-kind resource that is easy to understand, navigate, and use

Explore Transplant

• Explore Transplant is a nonprofit organization established to educate patients and caregivers on transplant and living donation\(^1\)

• **My Transplant Coach** is an interactive decision aid for patients with kidney failure that is part of the Explore Transplant educational program\(^2\)
  
  – A recent pilot study found that MyTransplant Coach significantly increased transplant knowledge \((P<0.001)\)\(^3\)

• **Explore Transplant and Explore Living Donation** education materials are available in English and Spanish and help kidney patients and their caregivers make informed choices about treatment\(^1\)

---

Live Donor Champions Can Assist Patients by Serving as Advocates

- Live donor champions (LDCs) are family members or friends who serve as patient advocates and can help identify suitable living donors

Results of LDC training
- Trained LDCs became more comfortable initiating conversations about live kidney donation
- Significantly more potential donors contacted the transplant center
- Significantly higher rates of living donor transplantation were reported

<table>
<thead>
<tr>
<th></th>
<th>LDC Participants (n=15)</th>
<th>Matched Controls (n=15)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Donor inquiries</td>
<td>25</td>
<td>0</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Outcomes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Live donor transplantation</td>
<td>4</td>
<td>0</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Live donor evaluation pending</td>
<td>3</td>
<td>0</td>
<td>Not reported</td>
</tr>
<tr>
<td>Deceased donor transplantation</td>
<td>4</td>
<td>5</td>
<td>Not reported</td>
</tr>
<tr>
<td>Deaths</td>
<td>0</td>
<td>0</td>
<td>Not reported</td>
</tr>
<tr>
<td>Wait-listed</td>
<td>4</td>
<td>10</td>
<td>Not reported</td>
</tr>
</tbody>
</table>


Increasing Donation Rates Through Social Media

- On May 1, 2012, Facebook® began allowing their users to select an organ donor status¹
  - A 21.1-fold increase over the baseline daily registration rate was observed on the first day of the Facebook initiative

- A Facebook app was also developed that allows transplant candidates to share their need for a donor with their Facebook friends²

- Transplant candidates who used the Facebook app were more likely to have a potential donor come forward than matched controls ($P<0.001$)²

---


---

**Time to First Donor Referral²**

<table>
<thead>
<tr>
<th>Follow-up Time, months</th>
<th>Control</th>
<th>Facebook app</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>154</td>
<td>54</td>
</tr>
<tr>
<td>2</td>
<td>150</td>
<td>53</td>
</tr>
<tr>
<td>4</td>
<td>144</td>
<td>49</td>
</tr>
<tr>
<td>6</td>
<td>142</td>
<td>46</td>
</tr>
<tr>
<td>8</td>
<td>139</td>
<td>46</td>
</tr>
<tr>
<td>10</td>
<td>138</td>
<td>40</td>
</tr>
</tbody>
</table>

Percentage

$P<0.001$

Number at risk

Control

Facebook app

Using House Calls to Educate on Living Donor Transplantation

- Racial/ethnic disparities exist in living donor transplant rates, mostly affecting black patients with ESRD
- Educational interventions developed to address these disparities have been evaluated
- Patients were randomized to receive 1 of 3 educational interventions
  - House call – held in a patient’s home, included invited guests (n=54)
  - Group based – held at a transplant center, included invited guests (n=49)
  - Individual counseling – 1-on-1 counseling between a patient and a health care provider at a transplant center (n=49)

Educating a patient’s social network may increase the likelihood of identifying potential living donors

Conclusions

• Kidney transplantation provides a well-established benefit to patients with ESRD

• Strategies to improve access to kidney transplantation will allow as many patients as possible to receive this beneficial treatment

• Early transplantation with underutilized deceased donor kidneys may provide survival benefits over waiting for a lower-KDPI kidney and does not affect program reports

• Living donation is associated with improved patient outcomes; risk prediction tools and KPD may improve utilization of living donor kidneys

• Educational programs for caregivers, patients, and family members may be used to better understand the transplant process, make informed treatment decisions, and identify potential living donors
Conclusions

• Kidney transplantation provides a well-established benefit to patients with ESRD

• Strategies to improve access to kidney transplantation will allow as many patients as possible to receive this beneficial treatment

• Early transplantation with underutilized deceased donor kidneys may provide survival benefits over waiting for a lower-KDPI kidney and does not affect program reports

• Living donation is associated with improved patient outcomes; risk prediction tools and KPD may improve utilization of living donor kidneys

• Educational programs for caregivers, patients, and family members may be used to better understand the transplant process, make informed treatment decisions, and identify potential living donors