Update on Kidney Allocation

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Association for Multicultural Affairs in Transplantation

Silas P. Norman, M.D., M.P.H.
Associate Professor
Division of Nephrology
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Disclosures

• United Network for Organ Sharing
  – Minority Affairs Committee, past Chairman
• National Kidney Foundation of Michigan
  – Scientific Advisory Board
• Minority Organ Tissue Transplant Education Program
  – Detroit Foundation Board
• Mitzvah Circle Foundation
  – Board of Directors
Objectives

• To discuss components of successful wait-listing and transplantation

• To discuss the current kidney allocation system

• To discuss ongoing challenges to ensuring equity in kidney transplantation
What Needs to Happen to be Transplanted?

- Stage 4-5 Chronic Kidney Disease (CKD)
- Referral to transplant center
- Assessment by referring provider
  - Interest in transplant
  - Social situation
  - Transportation
  - Medical compliance
- Kidney transplant evaluation
  - Completion of testing
  - Looking for living donors
  - Ensuring support network
The Specifics of Allocation Policy are Important

• In 2014:
  – 11,570 Deceased donor transplants
  – 5,338 Living donor transplants

• In 2015, national waitlist exceeds 109,000
  ▪ ~ 34% African-American, ~ 19% Hispanic
  ▪ Additional > 36,000 added to list annually

• Result:
  ▪ Median wait time for AA and Hispanic patients tends to be 1.5 - 2 years longer than for non-Hispanic whites
  ▪ Annually 8,000 patients removed due to death and illness that precludes transplant
Organ Procurement Transplantation Network (OPTN) Final Rule

- Allocation systems must:
  - Be based on **sound medical judgment**
  - Seek to **achieve the best use** of donated organs
  - Be designed to **avoid wasting organs**, to **avoid futile transplants**, to **promote patient access to transplantation**, and to **promote the efficient management** of organ placement
  - Set priority rankings...through **objective and measurable medical criteria**
## Previous Kidney Allocation System

<table>
<thead>
<tr>
<th>Medical Criteria</th>
<th>HLA Match</th>
<th>0-2 points for 0-2 HLA-DR match</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>- Increases graft survival</td>
<td></td>
</tr>
<tr>
<td>Waiting Time</td>
<td>Starts at time of active wait-listing - as early as GFR &lt; 20</td>
<td>1 point at listing 1/365 point each day</td>
</tr>
<tr>
<td>Sensitization</td>
<td>Panel Reactive Antibody %</td>
<td>4 points for %PRA ≥ 80</td>
</tr>
<tr>
<td>Donor Quality</td>
<td>Standard Criteria Donor</td>
<td>Specific listing for ECD kidney</td>
</tr>
<tr>
<td></td>
<td>Extended Criteria Donor</td>
<td></td>
</tr>
<tr>
<td>Pediatric Priority</td>
<td>Age at listing &lt; 18 years</td>
<td>Additional waitlist points Share 35</td>
</tr>
<tr>
<td>Previous Living Donor</td>
<td>Live donor with ESRD</td>
<td>4 years waiting time</td>
</tr>
</tbody>
</table>
What Were the Problems with the Previous System?

- Did not conform to the OPTN Final Rule
- Waiting time assumes everyone has equal access to transplant evaluation
- Inconsistent allocation, i.e. Variances
- Thousands of potential future life years lost for patients
  - Mismatch between potential survival of the kidney and the recipient which increases the need for re-transplant
  - Favors young and healthy candidates
  - Allocation not linked to measure of benefit
Kidney Allocation System (KAS)

- KAS implemented Dec 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
# New/Current Kidney Allocation System

| Medical Criteria                  | Estimated Post-Transplant Survival (EPTS) and HLA DR Matching | Top 20% EPTS  
Everyone else  
DR points unchanged |
|-----------------------------------|---------------------------------------------------------------|-------------------------------------------------|
| **Waiting Time**                  | **Dialysis Time**  
-Starts at the earlier of dialysis initiation or wait-list registration  
-As early as GFR ≤ 20 | 1 point at listing  
1/365 point each day |
| **Sensitization**                 | **Calculated PRA (CPRA)** | Applied continuously from CPRA 20 – 100% |
| **Donor Quality**                 | **Kidney Donor Profile Index (KDPI)** | Continuous 0-1 scale  
4 levels of allocation |
| **Pediatric Priority**            | **Age at listing < 18 years** | Priority for KDPI < 35% |
| **Previous Living Donor**         | **Live donor with ESRD** | Priority for KDPI < 85% |
Additional Features of New System

- Encourages use of $A_2$ and $A_2B$ kidneys in ABO B candidates
- Elimination of variances
- Elimination of paybacks
Pediatric and Prior Living Donor Allocation

• Pediatrics
  – Previous Policy gave candidates listed prior to their 18th birthday priority for kidneys from donors aged < 35 (Share 35)
  – Current policy retains priority but instead of donor age will give priority for donors with KDPI < 35%

• Living Donors
  – Current Policy gives prior living donors 4 years of waiting time at the time of listing
  – Current policy retains priority and limits acceptable donor kidneys to those with KDPI < 85%
Medical Criteria: Longevity Matching

- **Expected Post-Transplant Survival (EPTS)**
  - Calculated from candidate age, time on dialysis, diabetes status and prior organ transplant
  - Measure of patient survival (vs. graft survival)

- The top 20% of candidates by EPTS will receive kidneys with longest survival potential (KDPI<20%)
Waiting Time Accrual

- Current policy begins waiting time points for dialysis time prior to registration
  - Applies to both pediatric and adult candidates
  - Better recognizes time spent with ESRD as the basis for priority
- Pre-emptive listing would still be advantageous for 0-ABDR mismatch offers and to limit dialysis wait time
Kidney Offer Rate and CPRA

Offers per Patient-Year

- Offer rate
- Offer rate (excluding 0-MM's)

CPRA

Offers per Patient-Year

2010

Offer rate

Offer rate (excluding 0-MM's)

Courtesy AB Leichtman
Consideration of Sensitization
Current Allocation System

CPRA Sliding Scale (Allocation Points)
(CPRA<98%)

(CPRA=98, 99, 100 receive 24.4, 50.09, and 202.10 points, respectively.)

Current

Previous

4 points

0 0 0 0.08 0.21 0.34 0.48 0.81 1.09 1.58 2.46
4.05
6.71
10.82
12.17
17.30
0 10 20 30 40 50 60 70 80 90 100
Points
CPRA

(CPRA≥98 receive 0, 4, and 4 points, respectively.)

Courtesy AB Leichtman
Donor Risk Index for SCD and ECD Kidneys
Kidney Donor Risk Index and Kidney Donor Profile Index

- **The Kidney Donor Risk Index (KDRI)**
  - Displays the relative risk of graft failure for kidneys compared to the “typical” kidney
  - Range of KDRI is 0.5 – 4.0

- **Kidney Donor Profile Index (KDPI)**
  - A continuous measure of donor quality from 0 (longest lived) to 100% (shortest lived) replaces SCD/ECD
Factors Used to Calculate the Kidney Donor Profile Index

- Donor age
- Race/ethnicity
- Hypertension
- Diabetes
- Serum creatinine
- Cause of death stroke
- Height
- Weight
- Deceased after cardiac death donor kidney
- Hepatitis C Virus positivity
## New Allocation System Sequence

<table>
<thead>
<tr>
<th>Sequence A</th>
<th>Sequence B</th>
<th>Sequence C</th>
<th>Sequence D</th>
</tr>
</thead>
<tbody>
<tr>
<td>KDPI &lt;=20%</td>
<td>KDPI &gt;20% but &lt;35%</td>
<td>KDPI &gt;35% but &lt;=85%</td>
<td>KDPI &gt;85%</td>
</tr>
<tr>
<td>Local CPRA 100</td>
<td>Regional CPRA 100</td>
<td>Local CPRA 100</td>
<td>Local CPRA 100</td>
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<td>Regional CPRA 100</td>
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<td>Regional CPRA 99</td>
<td>Local CPRA 98</td>
<td>Regional CPRA 99</td>
<td>Regional CPRA 99</td>
</tr>
<tr>
<td>Local CPRA 98</td>
<td>Zero mismatch (top 20% EPTS)</td>
<td>Local CPRA 98</td>
<td>Local CPRA 98</td>
</tr>
<tr>
<td>Prior living donor</td>
<td>Regional pediatric</td>
<td>Regional pediatric</td>
<td>Zero mismatch</td>
</tr>
<tr>
<td>Local pediatrics</td>
<td>Local adults</td>
<td>Regional adults</td>
<td>Prior living donor</td>
</tr>
<tr>
<td>Local top 20% EPTS</td>
<td>Local pediatric</td>
<td>National pediatrics</td>
<td>Local</td>
</tr>
<tr>
<td>Zero mismatch (all)</td>
<td>Regional pediatric</td>
<td>National adults</td>
<td>Regional</td>
</tr>
<tr>
<td>Local (all)</td>
<td>Regional (top 20%)</td>
<td>National (all)</td>
<td>National</td>
</tr>
<tr>
<td>Regional pediatrics</td>
<td>Regional (all)</td>
<td>National pediatrics</td>
<td><em>all categories in Sequence D are limited to adult candidates</em></td>
</tr>
<tr>
<td>Regional (all)</td>
<td>National (top 20%)</td>
<td>National (all)</td>
<td>National</td>
</tr>
</tbody>
</table>

*All categories in Sequence D are limited to adult candidates.*
Limitations of the New Allocation System

• **Arbitrary divisions of patient priority**
  – The 19% patient is not different from the 21% patient, but have different access to kidneys
  – What is “top 20%” will differ from OPO to OPO

• **Ignores half of the relevant biology of candidates**
  – No estimate of candidate mortality on the waiting list
  – Result is older and sicker patients put in a of waiting for an offer they may not survive to get

• **Geographic inequities not addressed**
KAS: The First Six Months
Background

- Performance tracked monthly through June, 2015

(\text{http://optn.transplant.hrsa.gov})

- Comprehensive, 6-month analysis requested by the kidney committee
  - Pre-KAS period: June 1, 2013 – December 3, 2014
    - (18 months)
  - Post-KAS period: December 4, 2014 – May 31, 2015
    - (6 months)
More young candidates (18-49) are receiving kidney transplants.

Over half of transplants are going to age 50+ recipients.
More African Americans and Hispanics are receiving kidney transplants.

Transplants have declined for Whites.
The distribution of transplants has changed little by recipient blood type.

- There are slight increases for B and AB.
• Transplants have increased for CPRA 99-100%
• Transplants have declined for CPRA 0% and 80-94%
Deceased Donor Transplants by Dialysis Duration

- More transplants are going to long dialysis duration candidates
- Fewer preemptive transplants are being performed
Who’s getting transplanted under KAS?

- 0 ABDR mismatches declined from 8.5% to 4.5% of transplants
- Slight increase in transplants to female recipients
- Under KAS, transplant rates have remained high for prior living donors (approx. 20 times the average patient)
- Four-fold increase in A2/A2B→B transplants (22 → 95 per year)
Longevity-matching under KAS

Percentage of Deceased Donor Kidney Transplants by KDPI and Recipient Age

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<thead>
<tr>
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<tbody>
<tr>
<td></td>
<td>KDPI 0-20</td>
<td>KDPI 21-34</td>
</tr>
<tr>
<td>0-17</td>
<td>2.9</td>
<td>0.8</td>
</tr>
<tr>
<td>18-34</td>
<td>2.5</td>
<td>1.9</td>
</tr>
<tr>
<td>35-49</td>
<td>5.5</td>
<td>4.5</td>
</tr>
<tr>
<td>50-64</td>
<td>7.1</td>
<td>6.5</td>
</tr>
<tr>
<td>65 Plus</td>
<td>2.9</td>
<td>2.6</td>
</tr>
<tr>
<td>All</td>
<td>20.9</td>
<td>16.2</td>
</tr>
</tbody>
</table>

- KDPI 0-20%: 61% are going to EPTS Top 20% recipients
- Over half (52%) of EPTS Top 20% recipients received a KDPI 0-20% kidney
Rates of Kidney Transplantation from Living and Deceased Donors for Blacks and Whites in the U.S. 1998 to 2011

Figure 1. Incidence of Kidney Transplantation in Black and White Recipients Between 1998 and 2011

The incidence was adjusted for age, sex, end-stage renal disease (ESRD) cause, and geographic region.

Sood et al. JAMA Online, August 31, 2015
Rates of Kidney Transplantation from Living and Deceased Donors for Blacks and Whites in the U.S. 1998 to 2011

Figure 2. Incidence by donor status of kidney transplantation in Black and White recipients between 1998 and 2011

Sood et al. JAMA Online, August 31, 2015
Ongoing Challenges

• New data showing equal rates of transplantation very important
  – Shows the impact of allocation policy on peoples lives
  – Along with preliminary KAS outcomes can be positive about future transplant results

• However…
There are issues unaddressed by allocation policy:

- Referral to transplant center
- Assessment by referring provider
  - Interest in transplant
  - Social situation
  - Transportation
  - Medical compliance
- Kidney transplant evaluation
  - Completion of testing
  - Looking for living donors
  - Ensuring support network
Steps to Kidney Transplant

- Medically Suitable and Interested in Transplant
- Definitely Interested in Transplant (OR=0.68)
- Completion of Transplant Work up (OR=0.56)
- Movement Up Waiting List and Successful Transplant (OR=0.50)
- Referral for Transplant Evaluation
- Transplant Waitlisting

Alexander, GC, Sehgal, AR
Medical Suitability

• Discussion assumes access to health-care system
• Physicians underestimate the interest in transplantation of minorities and women—contributing to later referral for transplant evaluation
• African-Americans with similar degrees of medical illness, less likely to be considered suitable candidates
• “Non-compliance” may be subjective and evaluation may reveal cultural biases
• African Americans “relative” survival advantage on dialysis may lead providers to discount benefit of transplant
Interest in Transplantation

• Patient perceptions affect their likelihood of waitlisting (Klassesen AC, 2002)

• Ayanian et al:
  – AA less likely than whites to have had transplant discussed with them
  – Physicians less likely to believe in transplant survival advantage for AA
  – Few physicians thought patient-physician communication or physician bias were important reasons for relative lack of transplant in AA
Variation in Referral

- RaDIANT Study
  - 1/1/2005 – 12/31/2012
  - Emory, Georgia Regents, Piedmont referral information
  - Linked to USRDS (CMS 2728)
  - Linked to American Community Survey
  - Primary outcome = referral for transplant evaluation within one year of dialysis initiation
  - Secondary outcome = placement on waiting list

Variation in Referral

• Results
  – N = 27,605 initiating dialysis
  – N = 8,391 referred patients (1,675 pre-emptive)
  – Pre-emptive patients more likely white, young, insured and fewer medical co-morbidities
• Overall 22% - 34% of patients referred
• Facilities with lowest likelihood of referral
  • Non-profit, hospital-based, more patients, treat patients living in high poverty neighborhoods, higher patient/social worker

Variation in Referral

- Patient Characteristics of those not referred
  - Older
  - White
  - Female
  - More tobacco use
  - More co-morbidities
  - Lower utilization of pre-ESRD nephrology care
  - More likely to have Medicaid or Medicare
  - Live in high poverty neighborhoods
  - Non-profit, larger facilities, higher pt/sw ratios

Completion of Transplant Work Up

• African-Americans are less likely to complete transplant workups
  – Overall 38.8% of whites and 46.5% of African-Americans had incomplete workups at 90 days (Epstein et al, 2000)
  – Reasons for this discrepancy unclear
    • Access to care
    • Understanding of requirements
    • Transportation limitations
    • Financial difficulties
    • Limited living kidney donor opportunities
Likelihood of Evaluation and Waitlisting after Referral

• Decreased likelihood to ascend steps to transplant
  – Older age
  – Lower median income
  – Non-commercial insurance
Likelihood of Waitlisting by race, ethnicity and insurance type

Table 4. Likelihood for referred patients to not be placed on the waiting list based on interaction of race/ethnicity and primary insurance

<table>
<thead>
<tr>
<th>Primary Insurance</th>
<th>Race/Ethnicity</th>
<th>African American</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Caucasian</td>
<td></td>
</tr>
<tr>
<td>Commercial</td>
<td>Reference group</td>
<td>0.93 (0.72 to 1.19)</td>
</tr>
<tr>
<td>Medicare</td>
<td>1.49 (1.04 to 2.13)</td>
<td>2.72 (1.76 to 4.19)</td>
</tr>
<tr>
<td>Medicare/Medicaid</td>
<td>2.23 (1.53 to 3.25)</td>
<td>2.96 (2.07 to 4.24)</td>
</tr>
<tr>
<td>Medicaid</td>
<td>12.18 (3.57 to 41.52)</td>
<td>11.09 (3.90 to 31.57)</td>
</tr>
<tr>
<td>None/self-pay</td>
<td>10.67 (6.28 to 18.13)</td>
<td>25.35 (10.60 to 60.62)</td>
</tr>
<tr>
<td>Combined noncommercial</td>
<td>Reference group</td>
<td>1.47 (1.07 to 2.01)</td>
</tr>
</tbody>
</table>

Table 5. Likelihood for referred patients to not be placed on the waiting list based on interaction of race/ethnicity and primary insurance conditional on receiving a transplant evaluation

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<thead>
<tr>
<th>Primary Insurance</th>
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<tbody>
<tr>
<td></td>
<td>Caucasian</td>
<td></td>
</tr>
<tr>
<td>Commercial</td>
<td>Reference group</td>
<td>1.02 (0.76 to 1.37)</td>
</tr>
<tr>
<td>Medicare</td>
<td>1.40 (0.91 to 2.15)</td>
<td>3.16 (1.96 to 5.09)</td>
</tr>
<tr>
<td>Medicare/Medicaid</td>
<td>2.45 (1.59 to 3.76)</td>
<td>2.98 (1.98 to 4.49)</td>
</tr>
<tr>
<td>Medicaid</td>
<td>7.84 (2.07 to 29.64)</td>
<td>3.60 (1.05 to 12.35)</td>
</tr>
<tr>
<td>None/self-pay</td>
<td>5.99 (3.25 to 11.04)</td>
<td>9.27 (3.62 to 23.70)</td>
</tr>
<tr>
<td>Combined noncommercial</td>
<td>Reference group</td>
<td>1.41 (0.98 to 2.02)</td>
</tr>
</tbody>
</table>
Summary

• There are a number of steps required for a patient to be successfully transplanted
• The new kidney transplant allocation system has a number of benefits but also some potential limitations
• The new allocation system is currently meeting goals
• Moving forward we still need to address issues of late referral and potential provider biases in evaluation and waitlisting practice
Questions?

• Thank you!