Learning Objectives

Upon completion, participants should be able to:

• Explain the rationale and objectives for the new kidney allocation scheme

• Understand how the revised kidney allocation policy addresses outcome objectives including maximizing transplant outcomes and reducing waiting times for historically disadvantaged patient populations

• Anticipate the practical impact of the new kidney allocation scheme on patients and referring clinicians

• Discuss transplant centers’ preparations for the new allocation system
Case 1: Old vs. New Scheme

A 24-year-old man is declared brain dead following an MVA, previously was in perfect health

- 74-year-old man, **blood group B in NC**, DM and CAD s/p CABG, 3 years listing and HD, DR matched, PRA = 10% (*5 points*)
- 30-year-old woman, **blood group AB in CA**, IgA, 3 years listing and HD, PRA = 79%, 4 antigen match (2A, 1B, 1DR); listed elsewhere (*4 points*)
- 50-year-old man, **blood group O in NY**, PKD, 4 years listing, PRA = 0%, 4 antigen match (2A, 2B, 0DR) (*4 points*)

Kidney Waiting List: How One Would Get Priority Points in 2013

**Time**
- Longest wait = 1 point (fractions of a point given for each candidate in order)
- 1 year = 1 point

**Match**
- Sharing a single HLA-DR mismatch with the donor = 1 point
- Sharing a zero HLA-DR mismatch with the donor = 2 points

**Sensitization**
- PRA ≥ 80% = 4 points

**Good Samaritan**
- Prior kidney donation = 4 points

ABO Frequency and Median Wait Time for Kidney Transplantation in the US

<table>
<thead>
<tr>
<th>ABO Frequency¹</th>
<th>O</th>
<th>A</th>
<th>B</th>
<th>AB</th>
</tr>
</thead>
<tbody>
<tr>
<td>US Black</td>
<td>49%</td>
<td>27%</td>
<td>20%</td>
<td>4%</td>
</tr>
<tr>
<td>US White</td>
<td>45%</td>
<td>40%</td>
<td>11%</td>
<td>4%</td>
</tr>
</tbody>
</table>

Median Wait Times²

|               | *1,851 days (5.1 years) | 1,207 (3.3) | 1,935 (5.3) | 853 (2.3) |

¹Racial & Ethnic Distribution of ABO Blood Types. www.bloodbook.com/world-abo.html
²OPTN. http://optn.transplant.hrsa.gov/latestData/step2.asp

Unadjusted Median Wait Times (Years) for Adults Transplanted in 2011, by State of Transplant Center

Patients age 18 years and older receiving a first-time, deceased-donor, kidney-only transplant in 2011

Old vs. New Scheme

All allocation sequences based on KDPI

Estimated Graft Survival Rates by KDPI

KDPI Variables
1. Donor age
2. Donor height
3. Donor weight
4. Donor ethnicity
5. h/o HTN
6. h/o DM
7. Cause of death
8. SCr
9. HCV status
10. DCD status
Predictive Model for EPTS

$\text{Raw EPTS} = 0.047 \times \max(Age - 25, 0) + 0.015 \times \text{Diabetes} \times \max(Age - 25, 0) + 0.398 \times \text{Prior Solid Organ Transplant} + 0.237 \times \text{Diabetes} \times \text{Prior Organ Transplant} + 0.315 \times \log(Years\ on\ Dialysis + 1) + 0.099 \times \text{Diabetes} \times \log(Years\ on\ Dialysis + 1) + 0.130 \times \{\text{Years\ on\ Dialysis} = 0\} + 0.348 \times \text{Diabetes} \times \{\text{Years\ on\ Dialysis} = 0\} + 1.262 \times \text{Diabetes}$

**Old vs. New: Case 1 (continued)**

24-year-old man, brain dead following an MVA, previously in perfect health (0.63, 6%)

<table>
<thead>
<tr>
<th>74-year-old man</th>
<th>5 points</th>
<th>58%</th>
</tr>
</thead>
<tbody>
<tr>
<td>DM and CAD s/p CABG</td>
<td>5 points</td>
<td>58%</td>
</tr>
<tr>
<td>3 years listing and HD</td>
<td>5 points</td>
<td>58%</td>
</tr>
<tr>
<td>PRA = 10%, DR matched</td>
<td>5 points</td>
<td>58%</td>
</tr>
</tbody>
</table>

30-year-old woman

<table>
<thead>
<tr>
<th>30-year-old woman</th>
<th>4 points</th>
<th>5%</th>
</tr>
</thead>
<tbody>
<tr>
<td>IgA</td>
<td>4 points</td>
<td>5%</td>
</tr>
<tr>
<td>3 years listing and HD</td>
<td>4 points</td>
<td>5%</td>
</tr>
<tr>
<td>PRA = 79%, 4 antigen match (2A, 1B, 1DR)</td>
<td>4 points</td>
<td>5%</td>
</tr>
<tr>
<td>Listed elsewhere</td>
<td>4 points</td>
<td>5%</td>
</tr>
</tbody>
</table>

55-year-old man

<table>
<thead>
<tr>
<th>55-year-old man</th>
<th>4 points</th>
<th>23%</th>
</tr>
</thead>
<tbody>
<tr>
<td>PKD</td>
<td>4 points</td>
<td>23%</td>
</tr>
<tr>
<td>4 years listing</td>
<td>4 points</td>
<td>23%</td>
</tr>
<tr>
<td>PRA = 0%, 4 antigen match (2A, 2B, 0DR)</td>
<td>4 points</td>
<td>23%</td>
</tr>
</tbody>
</table>
Proposed Point Changes: When Does Wait Time Begin?

**Current Policy:**
- Time begins at listing (eligible for listing with eGFR < 20 mL/min, including on RRT)

**New Scheme:**
- Time begins at listing with eGFR < 20 mL/min or with initiation of dialysis (if listed after start of RRT)

*Preemptive listing still advantageous for 0 ABDR mismatch offers and ability to accrue*

---

Weighing the Risk vs. Benefit of KDPI > 85%

**Do Not Use Kidney**
- Risk
  - Death on dialysis
- Benefit
  - Hope for better kidney

**Use Kidney**
- Risk
  - Early graft failure
  - Early mortality
- Benefit
  - Improved survival
Projected Life-Years Remaining for Patients on Wait List vs. With Transplant

Outcomes among recipients of first deceased-donor transplant, for dialysis patients placed on the wait list 1991-1997

<table>
<thead>
<tr>
<th>Age Range</th>
<th>DM Status</th>
<th>Projected Life-Years Without Transplant (n = 46,164)</th>
<th>Projected Life-Years With Transplant (n = 23,275)</th>
</tr>
</thead>
<tbody>
<tr>
<td>20-39</td>
<td>-</td>
<td>20</td>
<td>31</td>
</tr>
<tr>
<td></td>
<td>+</td>
<td>8</td>
<td>25</td>
</tr>
<tr>
<td>40-59</td>
<td>-</td>
<td>12</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td>+</td>
<td>8</td>
<td>22</td>
</tr>
<tr>
<td>60-74</td>
<td>-</td>
<td>7</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>+</td>
<td>5</td>
<td>8</td>
</tr>
</tbody>
</table>


Projected Life-Years Remaining for Patients on Wait List vs. With Transplant

Expected Remaining Life-Years

- US Population
- Dialysis Patients
- Transplant Recipients

KDPI Selection (New) vs. ECD (Old)

- Patients with high morbidity/mortality on dialysis:
  - Elderly, DM
- Patients with expected long duration on dialysis:
  - OPOs with long wait times, highly sensitized, long time already on dialysis
- Caution:
  - High peri-operative mortality, high BMI, highly sensitized, retransplant, frailty

Pre-Transplant Wait Times by Blood Type and PRA, Listed 2003-2004

<table>
<thead>
<tr>
<th>Median Wait Time Days (Years)</th>
<th>O</th>
<th>A</th>
<th>B</th>
<th>AB</th>
<th>PRA 0%-9%</th>
<th>PRA 10%-79%</th>
<th>PRA &gt; 80%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nationwide</td>
<td>1,851</td>
<td>1,207</td>
<td>1,935</td>
<td>853</td>
<td>1,381</td>
<td>1,884</td>
<td>NR</td>
</tr>
<tr>
<td></td>
<td>(5.1)</td>
<td>(3.3)</td>
<td>(5.3)</td>
<td>(2.3)</td>
<td>(3.8)</td>
<td>(5.2)</td>
<td></td>
</tr>
<tr>
<td>Region 11 VA, NC, SC, KY, TN</td>
<td>1,795</td>
<td>1,027</td>
<td>1,758</td>
<td>754</td>
<td>1,476</td>
<td>2,005</td>
<td>2,581</td>
</tr>
<tr>
<td></td>
<td>(4.9)</td>
<td>(2.8)</td>
<td>(4.8)</td>
<td>(2.1)</td>
<td>(4.0)</td>
<td>(5.5)</td>
<td>(7.1)</td>
</tr>
</tbody>
</table>
New Policy: Sensitization Points

Current Policy

PRA > 80% = 4 points
PRA < 80% = 0 points

New Policy

Sliding Scale = Improve Access, Outcomes?!

Candidate Sensitization Level, CPRA

<table>
<thead>
<tr>
<th>CPRA, %</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-19</td>
<td>0</td>
</tr>
<tr>
<td>20-29</td>
<td>0.08</td>
</tr>
<tr>
<td>30-39</td>
<td>0.21</td>
</tr>
<tr>
<td>40-49</td>
<td>0.34</td>
</tr>
<tr>
<td>50-59</td>
<td>0.48</td>
</tr>
<tr>
<td>60-69</td>
<td>0.61</td>
</tr>
<tr>
<td>70-74</td>
<td>1.09</td>
</tr>
<tr>
<td>75-79</td>
<td>1.58</td>
</tr>
<tr>
<td>80-84</td>
<td>2.46</td>
</tr>
<tr>
<td>85-89</td>
<td>4.05</td>
</tr>
<tr>
<td>90-94</td>
<td>6.71</td>
</tr>
<tr>
<td>95</td>
<td>10.82</td>
</tr>
<tr>
<td>96</td>
<td>12.17</td>
</tr>
<tr>
<td>97</td>
<td>17.3</td>
</tr>
<tr>
<td>98</td>
<td>24.4</td>
</tr>
<tr>
<td>99</td>
<td>50.09</td>
</tr>
<tr>
<td>100</td>
<td>202.1</td>
</tr>
</tbody>
</table>

New Policy: ABO Compatibility

Historic ABO Compatibility

<table>
<thead>
<tr>
<th>Recipient/Donor</th>
<th>O</th>
<th>A</th>
<th>B</th>
<th>AB</th>
</tr>
</thead>
<tbody>
<tr>
<td>O</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>AB</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

Allocation Within ABO

<table>
<thead>
<tr>
<th>Recipient/Donor</th>
<th>O</th>
<th>A</th>
<th>B</th>
<th>AB</th>
</tr>
</thead>
<tbody>
<tr>
<td>O</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>AB</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td>✓</td>
</tr>
</tbody>
</table>

Allocation in New System

<table>
<thead>
<tr>
<th>Recipient/Donor</th>
<th>O</th>
<th>A₁</th>
<th>A₂</th>
<th>B</th>
<th>A₁B</th>
<th>A₂B</th>
</tr>
</thead>
<tbody>
<tr>
<td>O</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>AB</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

Graft Survival of B Recipients: A<sub>2</sub> or A<sub>2</sub>B Donor Kidneys Compared With B or O Kidneys

Examination of A<sub>2</sub>/A<sub>2</sub>B donors to B recipients between Jan 1994 and Dec 2000 (n = 41) performed at a single Midwestern OPO vs. O/B to B (n = 80)

<table>
<thead>
<tr>
<th>ABO Combination</th>
<th>DWFG&lt;sup&gt;a&lt;/sup&gt; Censored</th>
<th>Graft Survival (Years)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>A&lt;sub&gt;2&lt;/sub&gt;/A&lt;sub&gt;2&lt;/sub&gt;B → B (n = 41)</td>
<td>Yes</td>
<td>91% (28)&lt;sup&gt;b&lt;/sup&gt;</td>
<td>91% (20)</td>
</tr>
<tr>
<td>B, O → B (n = 80)</td>
<td>Yes</td>
<td>91% (60)</td>
<td>86% (50)</td>
</tr>
<tr>
<td>A&lt;sub&gt;2&lt;/sub&gt;/A&lt;sub&gt;2&lt;/sub&gt;B → B (n = 41)</td>
<td>No</td>
<td>84% (28)</td>
<td>77% (20)</td>
</tr>
<tr>
<td>B, O → B (n = 80)</td>
<td>No</td>
<td>84% (60)</td>
<td>77% (50)</td>
</tr>
</tbody>
</table>

95.1% (39/41) of the B patients transplanted with A<sub>2</sub> kidneys consistently had low anti-A titers (< 4)

<sup>a</sup>Patient died with a functioning graft.
<sup>b</sup>The number in parentheses at each time-point represents the number of patients at risk through the end of each respective year.

Changes Expected in the New System

- > 8,000 additional life-years annually
- Slight increase in transplants to AA, blood group B, high PRA
- Changes in age distribution

OPTN. Proposal to Substantially Revise The National Kidney Allocation System.
http://optn.transplant.hrsa.gov/PublicComment/pubcommentPropSub_311.pdf

OPTN. Concepts for Kidney Allocation.
Preparations for the New Allocation System

For Physicians:

Educate Patients
- Not much will change
- Living donation remains the best option
- Early referral and early listing remain advantageous
- Patients with B-blood type and low-A₂ titers should consider A₂ organs
- Patients with high mortality rates on dialysis (either on dialysis or near starting dialysis) should consider organs with KDPI > 85%

For Transplant Center:

Educate Patients and Prepare Infrastructure
- Double check dialysis start dates and EPTS variables
- Educate and consent patients for KDPI organs > 85%
- Educate and consent patients with B-blood type for A₂ organs
- Review HLA data for all highly sensitized patients


To receive credit, click the “Take Post-Test” tab below for access to the evaluation, attestation, and post-test.

Contact Information

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