They’re Not Just for the Young Any More: Kidney Transplantation and Older Recipients

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Background
- The impact of Age in renal function
- Survival with Transplant (vs. Dialysis)
- Donor Gap
- Utilization and outcomes with Non-traditional donors
- The Future (as seen from today)

Relationship between Age and Kidney Function


Relationship between Age and Muscle Mass

Table 1. Age-Related Effects on Body Composition

<table>
<thead>
<tr>
<th>Population</th>
<th>Muscle*</th>
<th>Adipose Tissue*</th>
<th>Star*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Healthy young people</td>
<td>20%</td>
<td>20%</td>
<td>60%</td>
</tr>
<tr>
<td>Seniors, by age 74+</td>
<td>15%</td>
<td>40%</td>
<td>45%</td>
</tr>
</tbody>
</table>

* As percentage of body weight


Incident counts & adjusted rates of ESRD, by age

Geographic variations in adjusted prevalent rates of ESRD per million population, 2011, by HSA

December 31 points prevalent patients. Adj: age, gender, race, ethnicity. For 2011 ESRD patients.
Proportion of Elderly Candidates Listed for Transplantation - UCD by Year of Evaluation

Deceased donor donations (per 1,000 deaths), by state, 2010–2011

Deceased donor transplants, by age, gender, race, & primary diagnosis

Proportion of Elderly Recipients - UCD by Year of Transplantation (DD only)

Unadjusted median wait times (years) for adults transplanted in 2011, by state of transplant center

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

Donations per 1,000 deaths, from July 1, 2010 to 12/31, 2011.

2013 USRDS ADR fig 7.11

Half of Kidney Transplant Candidates Who Are Older than 60 Years Now Placed on the Waiting List Will Die before Receiving a Deceased-Donor Transplant

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Background and objectives: Waiting times to deceased-donor transplantation (DDT) have significantly decreased in the past decade. This trend particularly affects older candidates who have a high mortality rate on dialysis.

Using the deceased-donor kidney transplant database of the Scientific Registry of Transplant Recipients database, we calculated the probability of death among candidates on the deceased donor waiting list from 2005 through 2013. Using survival models, we estimated time to DDT and mortality after DDT among kidney transplant candidates.

Results: Among DDT candidates who were older than 60 years and listed in 2005 through 2007, the proportion of candidates who died on the waiting list before receiving a deceased donor肾 transplant was 51.5% (2005) to 57.8% (2007).

Clinical J American Society of Nephrology 2009
**Expanded Criteria Donor - ECD**

- UNOS- Sponsored Conference in 1997
  - "Rate of discard of deceased donors older than 60 years greater than 80%, yet living-donors at this age used successfully..."  
  - Acceptable increased risk of graft failure (compared to "standard organ donor" - SCD) and projected survival benefit (compared to dialysis and waitlist).

**Expanded Criteria Donor**

- October 2002 “Expanded Criteria Donor”
  - Donor age 60 or older
  - Donor age greater than 50 + 2 factors:
    - History of Hypertension
    - Death due to CVA
    - "Terminal creatinine" 1.5mg/dl or greater
  - Risk of graft failure 70% higher than SCD
  - SRTR data (ADR 2010)
  - 25% of deceased-donor in US were ECD

**Impact of ECD on Survival**


**ECD and Survival**


**Graft Survival 2006-2011 - UCD by Type of Deceased Donor**

- 84% SCD (n = 344)
- 76% ECD (n = 133)

**ECD Biopsy**

Histology and Outcomes

Dual Deceased Donor (ECD)

Dual adult donation equivalent to standard criteria donation UCD graft survival (1996-2010)

Dual Pediatric Deceased Donor (En-bloc)

Graft Survival 2006-2011 - UCD by Type of Deceased Donor

Growth of pediatric kidneys with time

SCD = Standard Criteria Donor
En-bloc = Pediatric en-bloc Donor

En-bloc vs. UCD graft survival over time.
Pulsatile Pump Preservation - UCD

- Protocol
  - All ECD and En-bloc kidneys

UCD Experience 2003 - 2008

Graft Survival - ECD Transplants by Preservation Modality

<table>
<thead>
<tr>
<th>Time after transplant (years)</th>
<th>Proportion Survival</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1.0</td>
</tr>
<tr>
<td>2</td>
<td>0.9</td>
</tr>
<tr>
<td>3</td>
<td>0.8</td>
</tr>
<tr>
<td>4</td>
<td>0.7</td>
</tr>
<tr>
<td>5</td>
<td>0.6</td>
</tr>
<tr>
<td>6</td>
<td>0.5</td>
</tr>
<tr>
<td>7</td>
<td>0.4</td>
</tr>
<tr>
<td>8</td>
<td>0.3</td>
</tr>
</tbody>
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Graft Survival - Pulsatile Perfusion

SCD vs. ECD

<table>
<thead>
<tr>
<th>Time after transplant (years)</th>
<th>Proportion Survival</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1.00</td>
</tr>
<tr>
<td>2</td>
<td>0.90</td>
</tr>
<tr>
<td>3</td>
<td>0.80</td>
</tr>
<tr>
<td>4</td>
<td>0.70</td>
</tr>
<tr>
<td>5</td>
<td>0.60</td>
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<td>6</td>
<td>0.50</td>
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<tr>
<td>7</td>
<td>0.40</td>
</tr>
<tr>
<td>8</td>
<td>0.30</td>
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</tbody>
</table>

Summary:

- Chronic kidney disease prevalence increases with longer life expectancy
- Transplantation is the preferred modality of therapy
- Donor (organ) shortage prevents transplantation to realize its full potential
- Due to lower metabolic demands the elderly is well positioned to benefit from non traditional donor transplants

(Word of Caution)
Geriatric Syndromes

- Frailty (3 of 5 criteria)
  - Unintentional weight loss
  - Self-reported exhaustion
  - Slow gait speed
  - Hand grip weakness
  - Low physical activity
- Falls
- Cognitive impairment (dementia)
- Functional impairment and disability (decreased ability to perform ADLs)

Geriatric Syndromes and CKD

- 15% vs. 6% prevalence compared to non-CKD
- 79% of ≥80 y/o dialysis patients frail
- Major component of decline at dialysis initiation
- Further decline with hospitalizations
The Future

(one approach to improve)

- Kidneys “suffer” with the process of
  - Pre-harvesting phase
  - Preservation (cold)
  - Reperfusion (“rewarming”)
- Organ pre-conditioning (“repair”)

Normothermic Perfusion

Ex vivo normothermic perfusion of the kidney
Hosgood et al, Transplantation 2011

QUESTIONS?