Liver Allocation Forum:
Economic Implications of Redistricting

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Collaborators and Funding

- Economic analysis team
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  - Sommer Gentry, Ph.D. Dorry Segev MD, Ph.D.

- Support
  - US Department of Health and Human Services, Health Resources and Services Administration, Healthcare Systems Bureau, Division of Transplantation, HHSH250201000018C.
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Liver transplantation is highly resource intensive

- Average Medicare spending exceeds $100,000 per patient for direct care
- Excludes organ acquisition cost

Cost drivers

- Severity of illness
- Patient disease (e.g. Hepatocellular Carcinoma)
- Demographic characteristics (age, gender, socioeconomic status)
Economic of Redistricting

- **Goal:**
  - Evaluate the impact of redistricting on the total cost of ESLD care for waitlisted population

- **Cost of ESLD includes care for:**
  - Waitlisted patients
  - Transplant episode
  - Post transplant care
  - Transportation costs
Economic Assessment

- Pre-Transplant care
- Transplant event
- Cost of ESLD
- Post-Transplant Care
- Organ Transportation
Methodology

- Economic analysis
  - Linked Medicare-OPTN data set for patients transplanted from 2002-08
  - > 15,000 patients with Medicare primary insurance listed for transplantation
  - 35% of all liver transplants
  - Includes continuous updated MELD scores
- Simulation analysis
  - 5 year cohort of recipients listed for transplant
Economic Assessment

- Transplant Hospitalization
- Post-Transplant Care
- Cost of ESLD
- Pre-Transplant care
- Organ Transportation
## MELD Score at Transplant

<table>
<thead>
<tr>
<th>Score Range</th>
<th>Current Allocation (Share 35)</th>
<th>Fully Regional Sharing</th>
<th>8-district Regional Sharing</th>
<th>4-district Regional Sharing</th>
</tr>
</thead>
<tbody>
<tr>
<td>6-15</td>
<td><strong>7,004</strong></td>
<td>7,691</td>
<td>7,761</td>
<td>7,498</td>
</tr>
<tr>
<td>16-25</td>
<td>11,754</td>
<td>9,667</td>
<td>8,595</td>
<td>7,387</td>
</tr>
<tr>
<td>25-30</td>
<td><strong>2,800</strong></td>
<td>3,142</td>
<td>3,798</td>
<td>4,631</td>
</tr>
<tr>
<td>30-35</td>
<td><strong>3,868</strong></td>
<td>4,228</td>
<td>4,480</td>
<td>4,859</td>
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<tr>
<td>35+</td>
<td>4,508</td>
<td>4,284</td>
<td>4,411</td>
<td>4,546</td>
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## Transplant plus one-year follow-up

<table>
<thead>
<tr>
<th></th>
<th>Mean Cost</th>
<th>Total Cost</th>
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<tbody>
<tr>
<td>Share 35</td>
<td>$99,576</td>
<td>$2.984 billion</td>
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<tr>
<td>Regional sharing</td>
<td>$99,242</td>
<td>$2.879 billion</td>
</tr>
<tr>
<td>8 district sharing</td>
<td>$99,950</td>
<td>$2.873 billion</td>
</tr>
<tr>
<td>4 district sharing</td>
<td>$98,472</td>
<td>$2.852 billion</td>
</tr>
<tr>
<td>Region/Type</td>
<td>Cost per pt./ month (median)</td>
<td>Total Cost</td>
</tr>
<tr>
<td>---------------------------</td>
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<td>----------------</td>
</tr>
<tr>
<td>Share 35</td>
<td>$ 1,214.</td>
<td>$488 million</td>
</tr>
<tr>
<td>Regional sharing</td>
<td>$ 1,222</td>
<td>$472 million</td>
</tr>
<tr>
<td>8 district sharing</td>
<td>$ 1,235</td>
<td>$479 million</td>
</tr>
<tr>
<td>4 district sharing</td>
<td>$ 1,248</td>
<td>$483 million</td>
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</tbody>
</table>
Economic Assessment

- Transplant Hospitalization
- Pre-Transplant care
- Cost of ESLD
- Post-Transplant Care
- Organ Transportation
- Transplant Care
Methods: Sample Patient

<table>
<thead>
<tr>
<th>JAN</th>
<th>FEB</th>
<th>MAR</th>
<th>APR</th>
<th>MAY</th>
<th>JUN</th>
<th>JUL</th>
<th>AUG</th>
<th>SEPT</th>
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</tbody>
</table>

**Observed**

- **MELD**: 12 → 14 → 18
- **PAYMENT**: 1100 → 1000 → 2000 → 200 → 1000

**Model**

- **MELD**: 12, 12, 12, 14, 14, 14, 14, 14, 18
- **COST**: 700, 700, 700, 800, 800, 800, 800

Monthly Cost
Adjusted cost per month by MELD

$2,030
$22,685

$2,030
$22,685
## Impact on Pre-Txp Severity of Illness

<table>
<thead>
<tr>
<th>Patient-months on Waitlist</th>
<th>Current Allocation (Share 35)</th>
<th>Fully Regional Sharing</th>
<th>8-district Regional Sharing</th>
<th>4-district Regional Sharing</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MELD 6 – 20</strong></td>
<td>628,338</td>
<td>660,580</td>
<td>674,691</td>
<td>671,506</td>
</tr>
<tr>
<td><strong>MELD 20 – 29</strong></td>
<td>97,261</td>
<td>100,882</td>
<td>97,557</td>
<td>101,538</td>
</tr>
<tr>
<td><strong>MELD 30 – 40</strong></td>
<td>8,747</td>
<td>7,725</td>
<td>6,113</td>
<td>4,509</td>
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</tbody>
</table>
Pre-transplant total costs / 5 years

- Share 35
- Regional sharing
- 8 district sharing
- 4 district sharing
Economic Assessment

- Transplant Hospitalization
- Pre-Transplant care
- Organ Transportation
- Cost of ESLD
- Post-Transplant Care
Transportation cost model

- Transportation cost estimates from:

- Transport by car: $1108
- Transport by helicopter: $4742
- Transport by charter fixed-wing plane:
  - The fixed-wing cost is distance dependant
  - Fixed cost + price per mile
## Transport mode: Impact of Redistricting

<table>
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<th>Current Allocation (Share 35)</th>
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<th>4-district Regional Sharing</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Airplane</strong></td>
<td>47%</td>
<td>33%</td>
<td>27%</td>
<td>16%</td>
</tr>
<tr>
<td><strong>Drive</strong></td>
<td>53%</td>
<td>66%</td>
<td>73%</td>
<td>84%</td>
</tr>
<tr>
<td><strong>Helicopter</strong></td>
<td>0.35%</td>
<td>0.44%</td>
<td>0.24%</td>
<td>0.15%</td>
</tr>
</tbody>
</table>
Transportation costs

$0, $2,000, $4,000, $6,000, $8,000, $10,000, $12,000, $14,000, $16,000

- Share 35
- Regional sharing 8 district sharing
- 4 district sharing
Total estimated cost per 5 years

Estimated costs for all waitlisted and transplanted (5 years)

- Share 35: $5,400,000,000
- Regional sharing: $5,350,000,000
- 8 district sharing: $5,300,000,000
- 4 district sharing: $5,250,000,000

$179,000,000
Who benefits from redistricting?

- Patients
  - Improved survival and reduced time at high MELD on the waiting list
  - 57% fewer patient months at a MELD > 30
- Insurers and Government Payers
  - Lower overall costs for patients with ESLD
  - Particularly public payers as patients are less likely to travel to low MELD regions
Whose costs may increase?

- Transplant centers in lower MELD regions
  - Higher MELD score at transplant
  - Increased transportation expenditures and staff expenditures
  - Increased pressure to use higher risk organs to meet demand
- Transplant centers in high MELD regions
  - Higher transportation costs to ship organs
  - Increased surgical staff cost if local teams do not recover the organs
Key Caveats

- Economic data is derived from Medicare payments
  - Actual costs may differ as DRG based payments may not reflect true “cost” of care
- Simulation analysis does not reflect changes in clinical practice
  - Increase competition will increase acceptance of marginal organs
- Unaccounted for costs:
  - Surgeon time
  - Administrative complexity
  - Impact of cold ischemic time
Summary

- Allocation policy is about fair, effective, and effective use of a limited resource.
- Economic analysis suggests that redistricting:
  - At minimum, is cost effective, and likely cost saving for the health care system.
- Shift to an accountable care model of population based care may better distribute the cost savings between providers and payers.