Transplant Economics:
Implications for Patients and Programs

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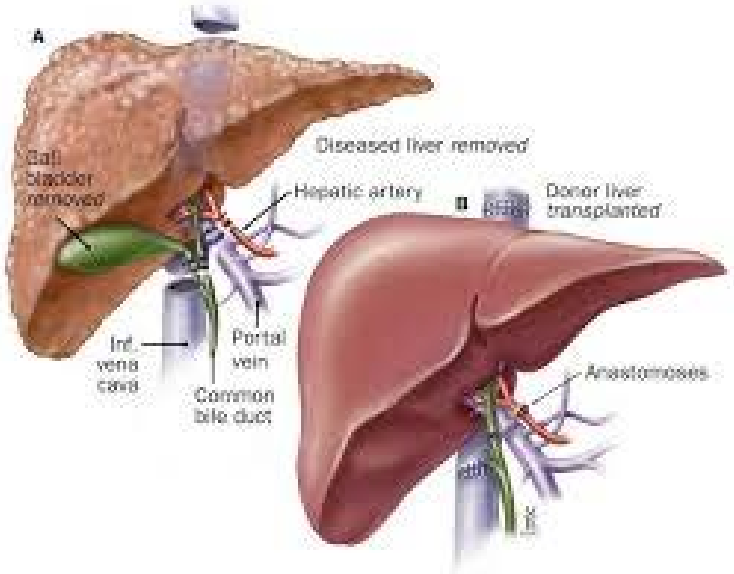
Disclosure

- Consultant to CareDx, Sanofi, Talaris
- No discussion of products or services from these companies and no discussion of off label pharmaceuticals

Transplant Economics

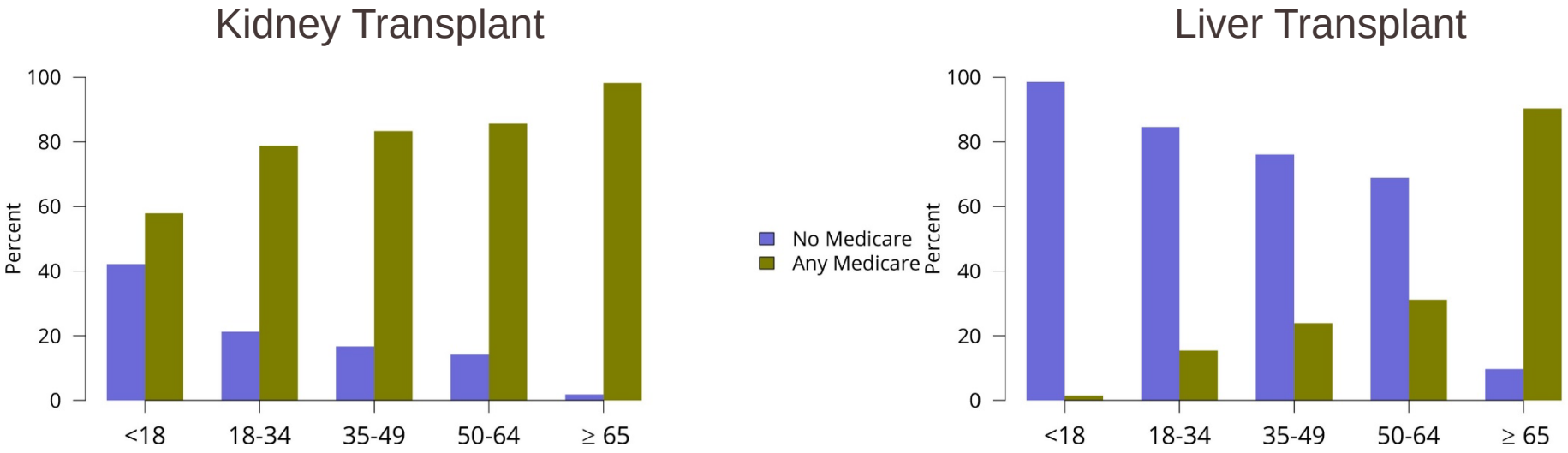
- Payer distribution in transplant
  - Public vs. Private
- Major economic drivers of organ transplant cost
  - Recipient characteristics
  - Donor quality
  - Allocation Policy



Economic Evaluation Methods

- Two distinct linked data sets for Analysis
  - Payment: Medicare-SRTR Registry linked based on SSN
    - Part A and B only (does not include organ acquisition)
  - Cost: Vizient-SRTR Registry probabilistic matching
    - Includes organ acquisition cost
- Multivariate linear regression modeling adjusting for donor, recipient, and transplant characteristics
- IRB approved

Who pays for transplant?



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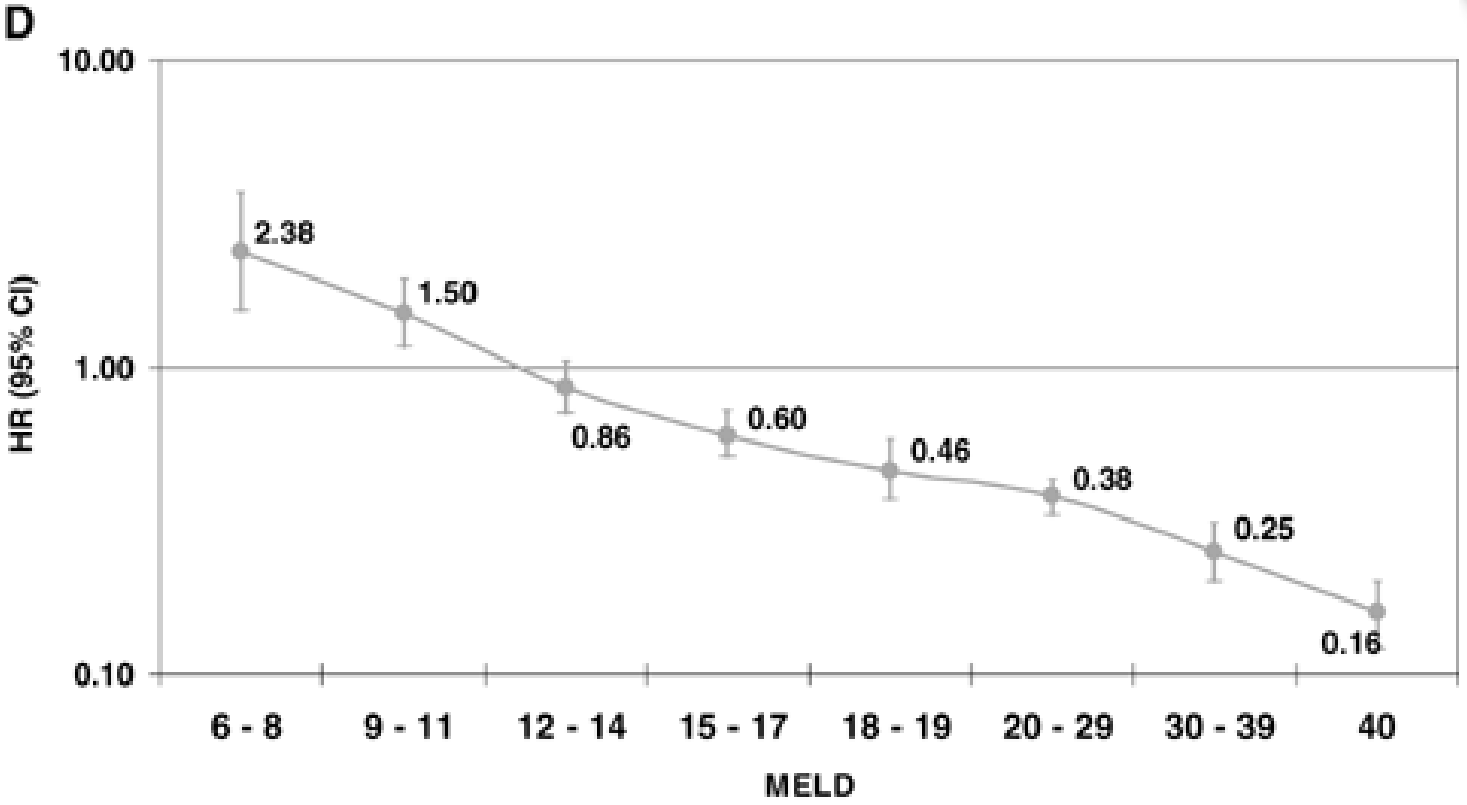
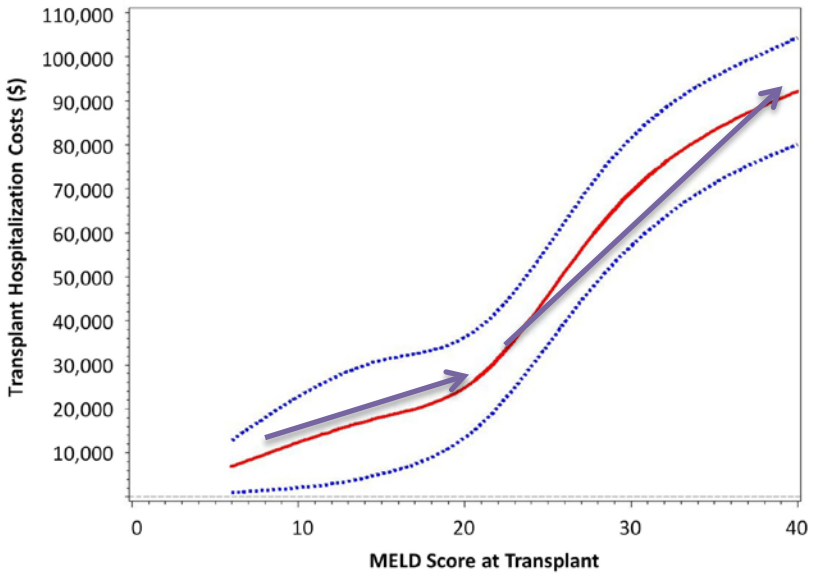
MELD and Transplant Benefit



Merion et al. AJT 2005

Finanial Implications of Recipient Severity of Illness

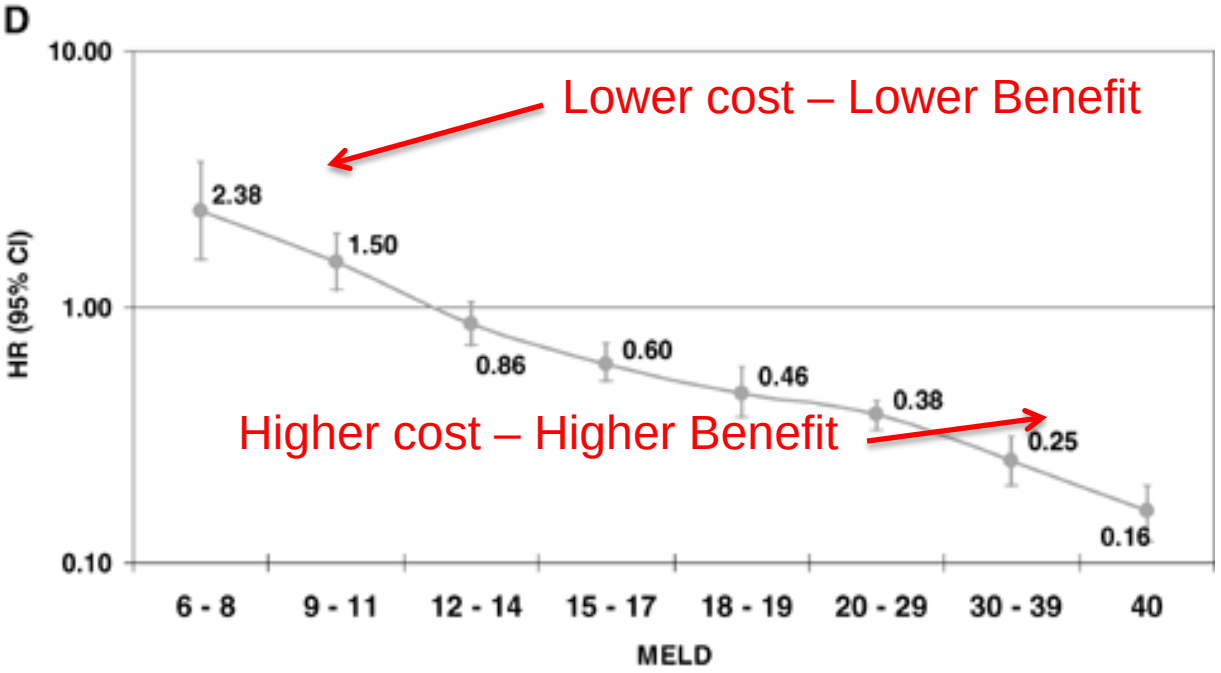


Hospital costs not including organ acquisition

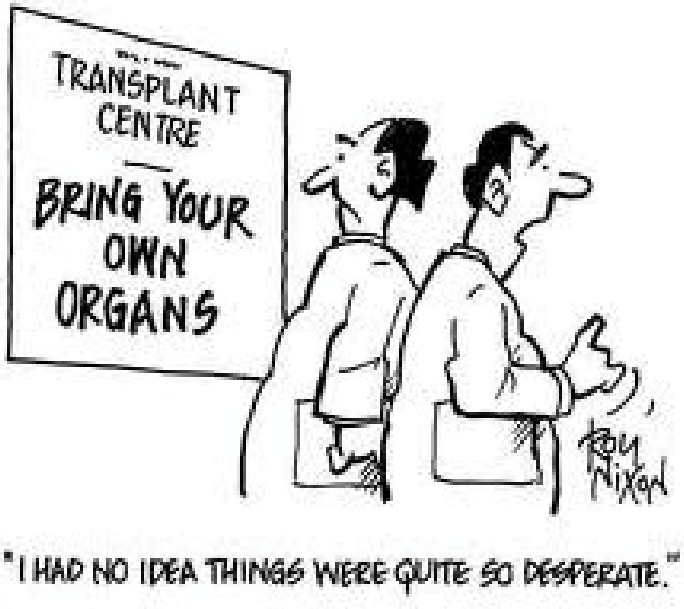
- Non-linear association of cost and severity of illness
- Fixed transplant costs
  - Minimal increase < MELD 22
  - Operating room
  - ICU -Recovery
  - Anesthesia
- Dramatic increase at higher MELD
  - Dialysis
  - Ventilator use
  - Length of ICU stay

Axelrod et al. Liver Txp 2011

Liver: Transplant benefit



Donor Characteristics

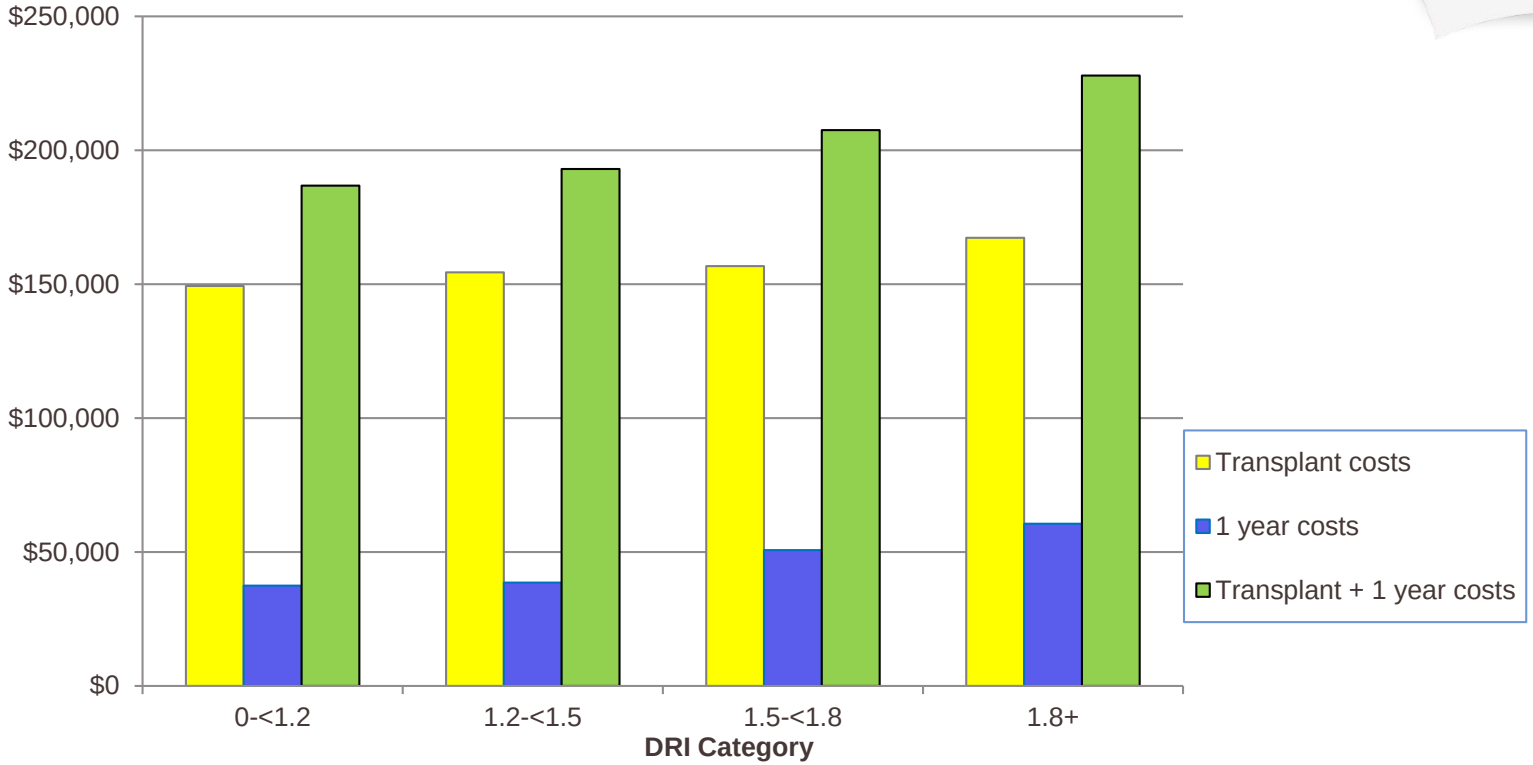


Donor Risk Index

- Developed by Feng et al. to quantitatively assess risk of graft failure following liver transplant
  - 3 demographic factors: age, race, height
  - Cause/manner of death: COD-CVA, COD-Other, and DCD
  - Graft type: split vs. whole graft
  - Cold ischemic time
  - National or regional organ sharing
- Increasing DRI strongly correlated with risk of graft failure
- DRI is one measure of graft quality.

Feng et al. AJT 2006

Impact of Donor Quality on Cost



Salvalaggio et al. Liver Txp 2011

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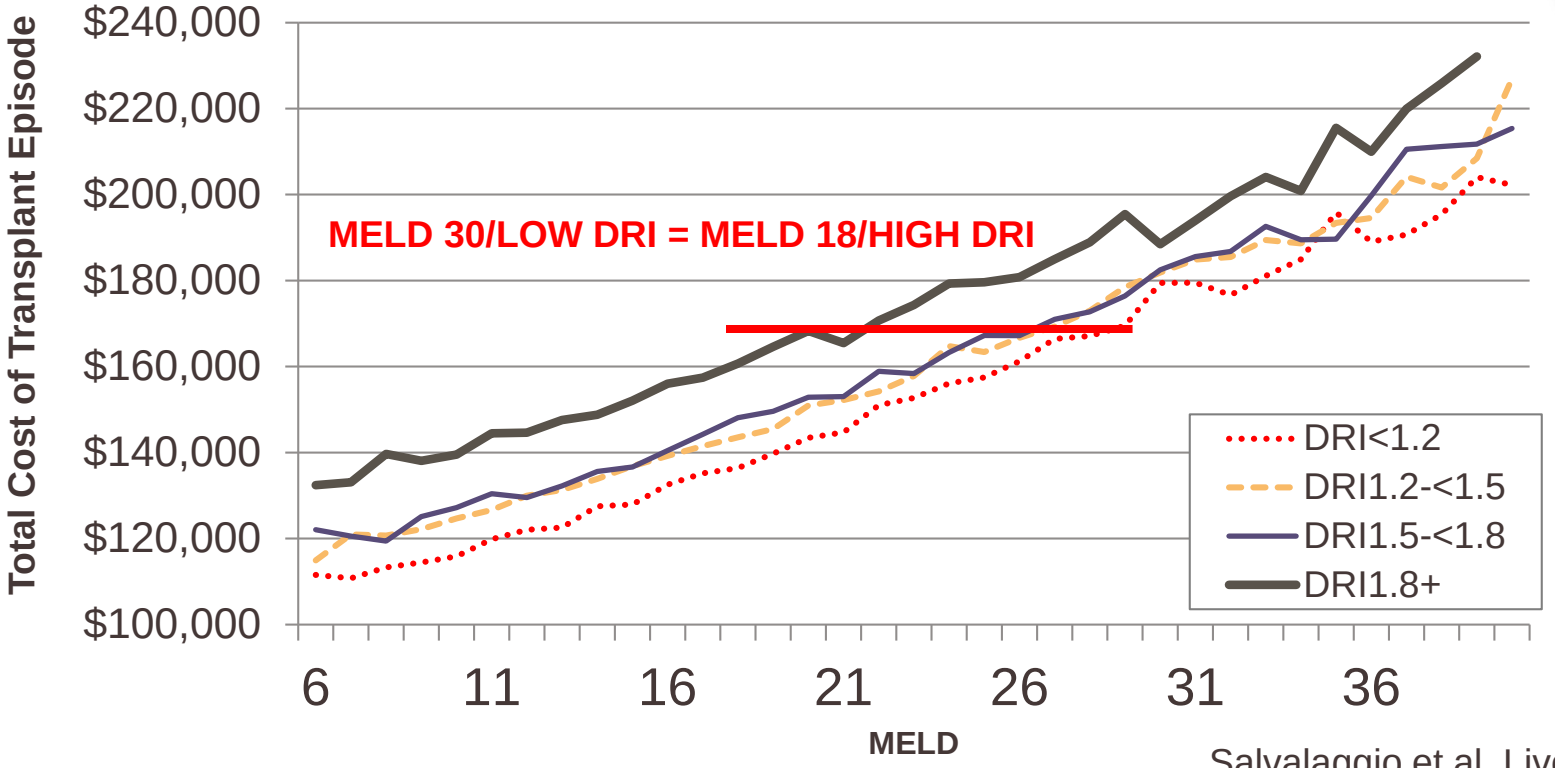
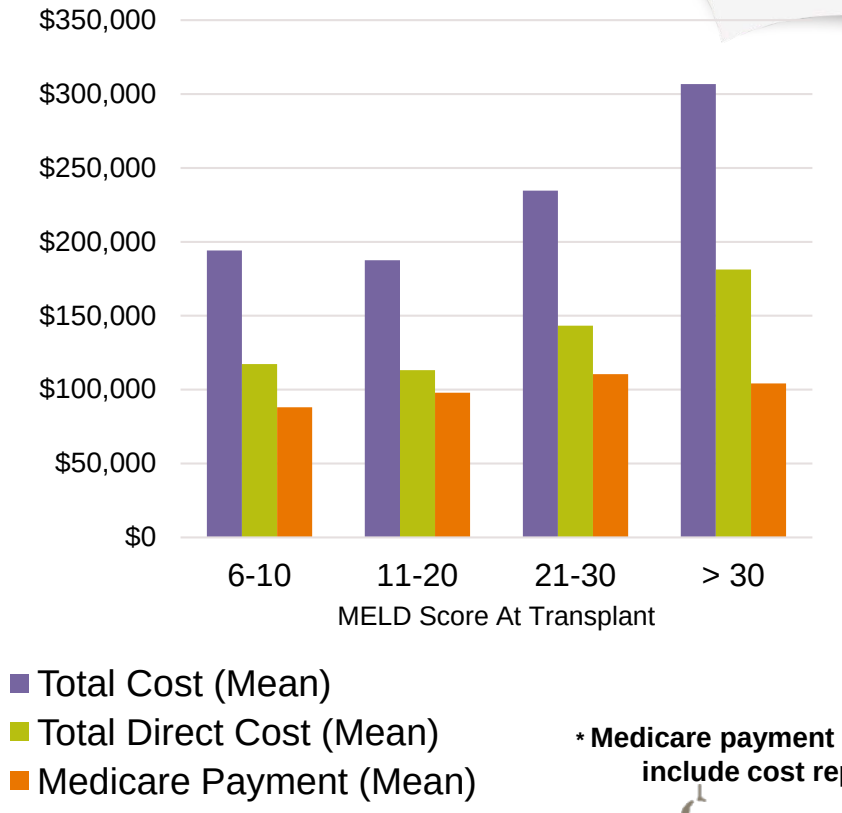


Salvalaggio et al. Liver Txp 2011

Financial Realities

- TC reimbursement **is not tied to severity of illness or donor quality**
  - Increasing use of marginal organs in high MELD patients is likely to further decrease TC profitability
- Adversely impact **TC in highly competitive regions**
  - Competition for limited organs
  - Higher MELD scores at transplant
  - Increasing need to utilize marginal donors



* **Medicare payment does not include cost report**

Axelrod AJT 2019

Reallocation/Logistics

- Broader sharing will increase need for air transport and prolong cold ischemic times
- Increase the cost of transplant across all severity of illness

Hospital Cost- Liver Transplant

Transplant Characteristic	Coefficient	P-value
Year of Transplant	$4,930.80	<.0001
MELD (per point)	$3,745.13	<.0001
Recipient Age	($615.19)	<.0001
DCD	($4,592.96)	0.0426
Donor Age	($343.22)	<.0001
Donor BMI	($832.99)	<.0001
Donor Creatinine	($1,009.35)	0.0012
Imported Organ	$10,618.00	<.0001
CIT (per hour)	$4,266.01	<.0001

N=46,509 Isolated Liver Transplant; Vizient Corporation

Economic Challenges in Transplant in 2021

- Organ supply remains inadequate
  - Greater demand for transplant services
- Recipient severity of illness is increasing
  - Greater degree of comorbidities
  - Allocation system reform greater severity of illness (MELD) at transplant
- Inadequate reimbursement given changes in transplantation
  - Contributes reduced access to transplant
  - Disincentivizes use of high risk organs
- Novel costs
  - Technology- normothermic perfusion