Impact of Regional Organ Sharing and Allocation in the UK Northern Liver Alliance (NLA) on Waiting Time to Liver Transplantation and Waitlist survival

Background

- Deceased-donor liver grafts (DDL) have been allocated in a centre-based system until recently.

- A supra-regional organ allocation system (NLA) was established in 2006 to improve access to DDLs for the sickest patients awaiting liver transplantation.
  - 3 Northern centres (Edinburgh, Newcastle and Leeds)
  - Patients with UKELD ≥62* listed on ‘top-band’
  - Prioritisation by UKELD score
  - Organs shared between centres
  - Organ ‘payback’ scheme

- Scheme mirrors “Share-35” system in US
  - Implemented from 2013

- We aimed to investigate the impact on waiting list outcomes

* MELD ≥25 until 2013

Massie AB, Am J Transplant, 2015
Methods

- Data retrospectively extracted from UK transplant registry (NHSBT)
  - Apr 2013 to Dec 2016
  - NLA centres compared with two non-NLA centres (King’s and Cambridge liver transplant units)
  - Changes in UKELD captured by sequential data

- Adult patients registered for first DDL transplant included in analysis

- Once patients are registered into top-band, they are not removed

- Periods of suspension from WL not included in WT
Methods, cont.

- Kaplan-Meier method used to estimate WL survival and WT to transplantation.
- WL survival – patients who were suspended, removed from WL (non-transplant reason), or transplanted were censored.
- WT – patients removed/suspended or died on WL were censored.
- Log-rank test used for comparisons. 
  - Bonferroni correction for multiple testing.
- Cox proportional hazards model used to ascertain impact of WT on post-transplant survival. 
  - All 7 liver transplant units included.
  - Adjusted with risk factors for post-transplant mortality.

*NHSBT, Annual report on liver transplantation, 2015/2016*
<table>
<thead>
<tr>
<th>Transplant centre</th>
<th>Non-top-band</th>
<th>Top-band</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>NLA centres</td>
<td>880</td>
<td>159</td>
<td>1039</td>
</tr>
<tr>
<td>Newcastle</td>
<td>129</td>
<td>32</td>
<td>161</td>
</tr>
<tr>
<td>Edinburgh</td>
<td>319</td>
<td>62</td>
<td>381</td>
</tr>
<tr>
<td>Leeds</td>
<td>432</td>
<td>65</td>
<td>497</td>
</tr>
<tr>
<td>Non-NLA centres</td>
<td>923</td>
<td>200</td>
<td>1123</td>
</tr>
<tr>
<td>Cambridge</td>
<td>322</td>
<td>65</td>
<td>387</td>
</tr>
<tr>
<td>King’s</td>
<td>601</td>
<td>135</td>
<td>736</td>
</tr>
<tr>
<td>Total</td>
<td>1803</td>
<td>359</td>
<td>2162</td>
</tr>
</tbody>
</table>
WL survival

- NLA top-band vs non-NLA top-band $p=0.9999$
  - 62.9 vs. 64.6%

- NLA top-band vs NLA non-top-band $p<0.0001$
  - 62.9 vs. 81.9%

- No difference between NLA non-top-band and non-NLA non-top-band
  - 81.9 vs. 86.4%

Significantly different amongst 4 groups ($p<0.0001$)
WT to transplantation

- Median WT NLA top-band shorter compared to non-NLA top-band
  - 23 vs. 99 days
  - \( p < 0.0001 \)

- Median WT non-top-band no different between NLA and non-NLA
  - 117 vs. 192 days
  - \( p = 0.2288 \)

Significantly different among 4 groups (\( p < 0.0001 \))
Impact of WT on post-transplant survival in top-band patients

• 315 top-band transplants from Apr 2013 to Dec 2016
  • 273 included in analysis
  • 42 excluded from analysis due to missing survival/risk factor data, or auxiliary transplant

• WT has no significant impact on 3-year risk-adjusted post-transplant survival (p=0.712)
  • 1-month increase in WT is associated with 4.6% increase in risk of death
  • HR 1.046 (95% CI 0.825-1.327)
Discussion

- NLA significantly shortened WT for top-band patients
- No improvement in WL survival
  - *No adverse impact upon non-top-band patients either*
- WT did not impact long-term survival in top-band patients
- Results can be seen as an ethically positive outcome
  - Sicker patients warrant special priority, irrespective of potentially lower ‘benefit’/utility
  - Mirrors US organ allocation policy and ‘final rule’
Discussion, cont.

• Survival benefit may not have been detected as each centre ensures timely transplantation of sickest patients
  • Patients censored at transplantation – *type 2 error*

• Initial analysis of Share-35 reported *30% reduction in WL mortality* in patients with MELD ≥35
  • Patients with MELD <35 not adversely affected
  • *Analyses limited through historical controls*

• Under Share-35, WL patients reprioritised were not disadvantaged by losing allocation
  • Similar analysis into NLA not possible retrospectively

*Chow EK, Am J Transplant, 2017*
Conclusions

- NLA achieved its aim of improving DDL transplantation access to those most in need
- Prioritisation of sickest patients did not improve WL survival
  - Did not disadvantage less sick patients
- Similar experience to US
- NLA will be absorbed into UK national allocation scheme based on transplant benefit score
  - Similar analysis into outcomes of patients UKELD ≥62 after national allocation warranted once long-term follow-up data sufficiently available
References


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• The organ donors, who with their passing, provide the ultimate gift