NHS
Blood and Transplant

The transplant benefit score and the national liver offering scheme

Caring Expert Quality

New national offering scheme

NHS Blood and Transplant

The development of a national set of rules to offer livers to named adult patients on the elective liver waiting list.

Initially, from Donors after Brain Death (DBD)
In future, from Donors after Circulatory Death (DCD)

Liver offering arrangements in the UK

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Current liver offering scheme

‘Local’ transplant centre receives the first offer.
Transplant centre allocates by blood group compatibility, size match and greatest need (i.e. sickest patient).

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Livers are offered nationally to **named patient predicted to gain the most survival benefit from receiving the particular liver graft on offer.**

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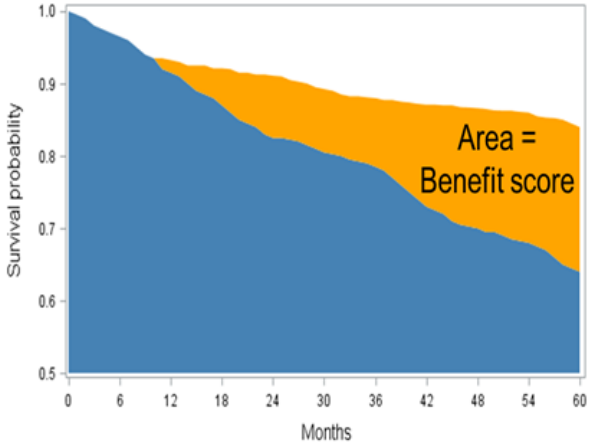
Livers are offered nationally to **named patient predicted to gain the most survival benefit from receiving the particular liver graft on offer.**

For each patient and the particular liver graft on offer:

The **benefit score** is calculated by measuring the difference between the area under the waiting list survival curve **(blue shading)** and the area under the post-transplant survival curve **(orange shading)** over a 5-year interval



A total of 21 recipient and 7 donor factors are integrated in the score, such as:

- recipient age
- gender
- indication for transplantation
- number of tumours
- renal support
- donor-recipient blood group compatibility
- donor age
- cause of death
- BMI
- history of diabetes
- whole or split liver

Timeline

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2007	Working Group established within NHSBT Liver Advisory Group (LAG)
2009	LAG agreed examination of a national offering scheme
2010	Different offering schemes proposed and discussed with stakeholders
2012	Liver consensus conference held - Concluded *transplant benefit* scheme most appropriate but further work was needed
2013	New Fixed-Term Working Group (FTWG) set-up by LAG
2014	*Transplant benefit* based offering recommended to LAG as the optimum
2014 - 2015	Stakeholder scrutiny period – including patient groups.
May 2015	LAG approved the recommendation of *transplant benefit* based core offering, in principle, together with *proportional offering* for variant syndrome patients.
2015 - 2018	After disbandment of the FTWU, the LAG Core Group has continued developing all other aspects of offering outside core offering.

Four offering schemes were investigated

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1. Need: Liver offered to patient with shortest predicted survival time without a transplant.

2. Utility: Liver offered to patient with longest predicted survival after transplantation.

3. Benefit: Liver offered to patient predicted to gain most net benefit (difference in predicted survival with and without transplant).

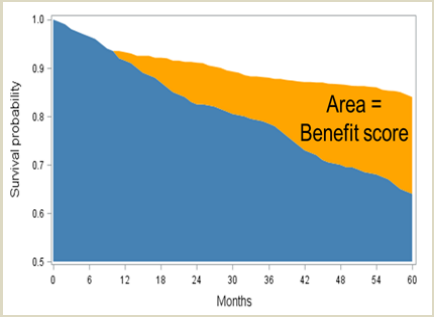
4. Status quo.

Survival without a transplant model

Adult 'non-urgent' liver-only UK registrations
Cancer cohort (n=660), 2009 to 2012
Non-cancer cohort (n=3859), 2006 to 2012

Survival after transplantation model

Adult 'non-urgent' liver-only transplants
Cancer cohort (n=430), 2009 to 2012
Non-cancer cohort (n=2495), 2006 to 2012



Transplant benefit

Area between the two survival curves

Factors predicting transplant list survival

Non-cancer
Recipient aetiology
Age
Gender
Creatinine, bilirubin, INR, sodium
Renal replacement therapy
In/outpatient
Registration year
[Interactions between factors]

Hepatocellular carcinoma
Recipient age
Gender
HCV
Renal replacement therapy
Creatinine, bilirubin, INR, sodium
In/outpatient
Registration year
Max AFP level
Max size tumour
Number tumours
[Interactions between factors]

Factors predicting post transplant survival

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Non-cancer

Recipient aetiology
Age, gender, HCV
Creatinine, bilirubin, INR, Na, K, albumin
Renal replacement therapy
In/outpatient
Prior abdominal surgery
Encephalopathy, ascites, diabetes
Waiting time
Donor age, cause of death, diabetes, BMI
Blood group, liver meets split criteria
[Interactions between factors]

Hepatocellular carcinoma

Recipient age
Gender
HCV
Renal replacement therapy
Creatinine, bilirubin, INR, Na, K, albumin
Recipient diabetes
In/outpatient
Prior abdominal surgery
Encephalopathy, ascites
Waiting time
Max AFP level
Max size tumour
Number tumours
Donor age, cause of death, diabetes, BMI
Blood group, liver meets split criteria
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Primary outcomes

Total number of deaths on the waiting list.

Cumulative years of expected patient survival both on the list and post transplant.

Estimate survival from the point of registration, not solely from the point of transplantation

Population life years

Simulation results

Mortality and patient-years associated with the current liver allocation scheme and the simulated allocation schemes based on the simulation period, 1 January 2013 to 31 December 2013 (1287 registrations; 629 DBD donors)

	No (%) died/ removed[1]	Patient-years
Current scheme	93 (7%)	4581
Need (M1)	48 (4%)	5187
Utility (M2)	95 (7%)	4779
Transplant benefit (M3)	48 (4%)	5262

[1] Removed due to condition deteriorated

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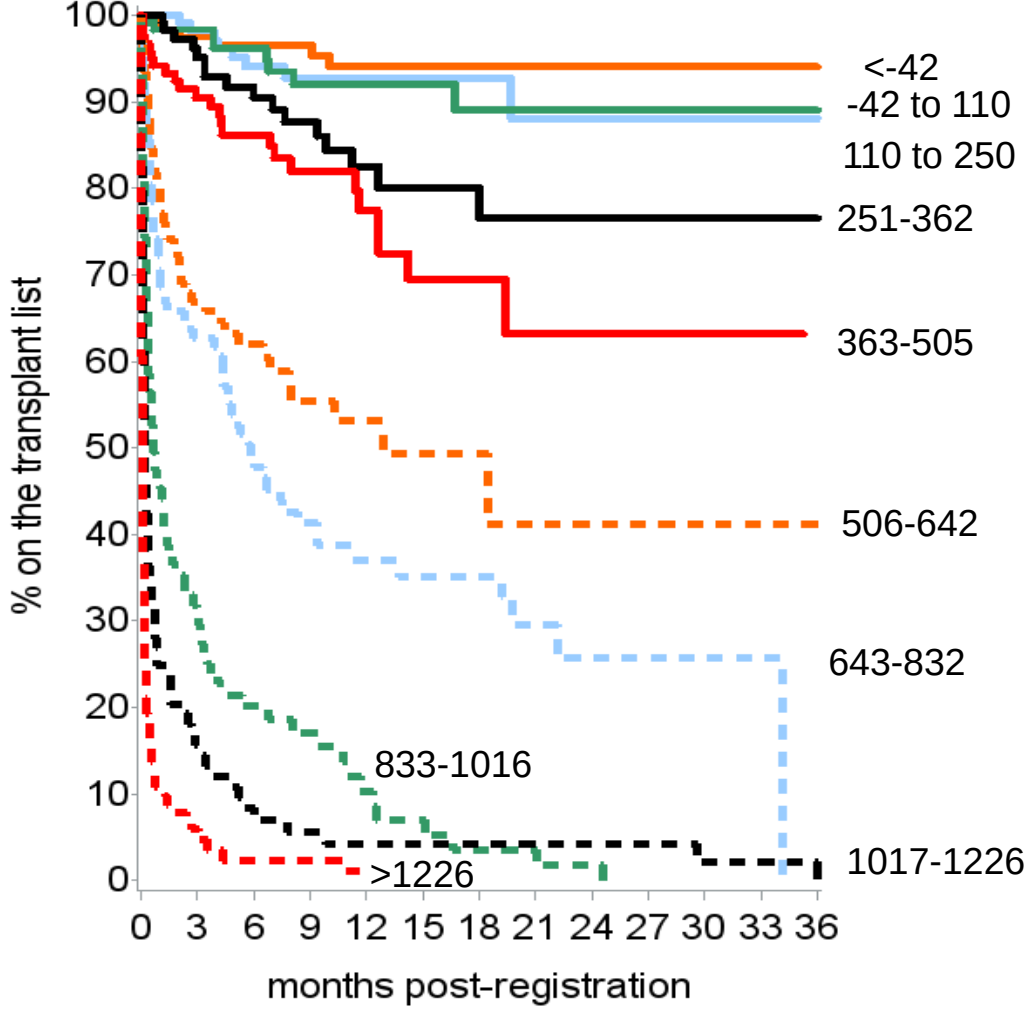

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TBS score at transplant and time waiting

Impact of recipient aetiology on TBS score for a patient with identical characteristics

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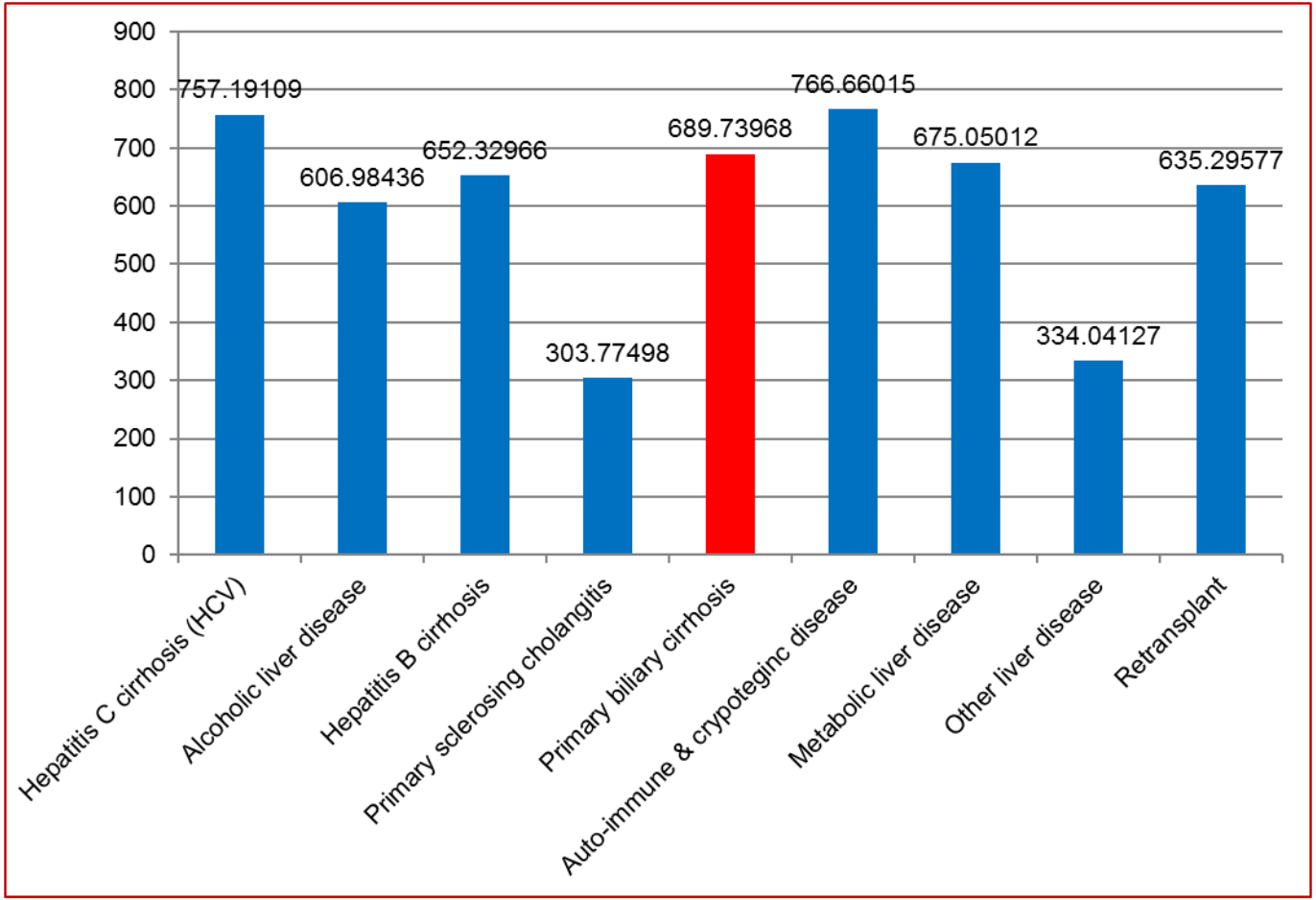

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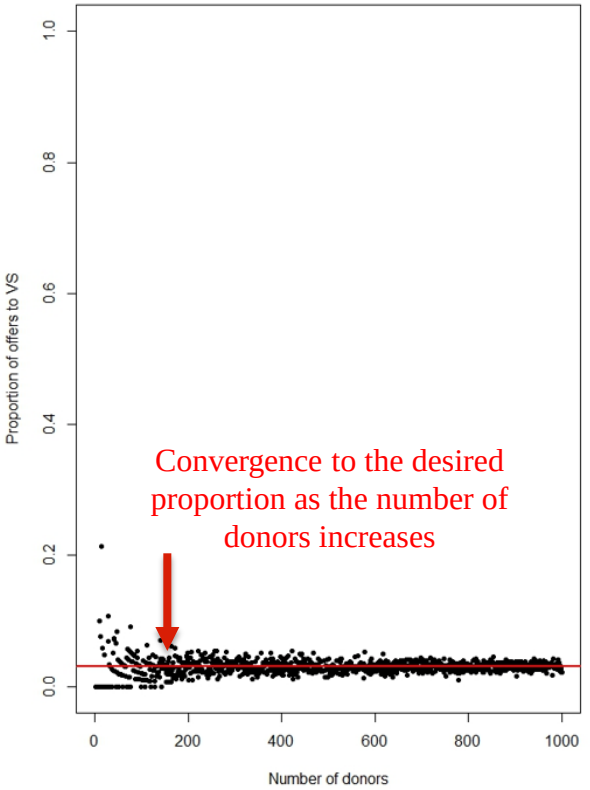
Variant syndromes and proportional offering

Proportional offering

- When an offering sequence for a DBD adult donor is generated, the algorithm will automatically decide whether to offer to the CLD/HCC list of recipients or the variant syndrome (VS) list.
- The decision is based on a probabilistic rule with:
  - 90% probability of selecting the CLD/HCC list
  - 10% probability of selecting the VS list
- The 10% probability is based on *the proportion of variant syndrome registrations* to the elective liver transplant list over the course of a year.
- This probability will be reviewed by NHSBT on a regular basis.



Post-launching Monitoring Committee

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- LAG has endorsed a proposal to set up a committee to monitor liver offering following the introduction of the new scheme.
- Committee being set up by the Associate Medical Director, ODT.
- Will include representation from:
  - Hepatologist
  - Lay member
  - LAG Core Group liaison
  - Transplant surgeon
  - Patient group
- NHSBT Statistics & Clinical Studies will provide full statistical support.

Summary

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1. NHSBT is introducing formal national offering schemes in all organ transplantation

2. Statistical model has been developed to predict outcome waiting for a transplant and post transplant. From these, a *transplant benefit score* (TBS) is calculated

3. The TBS score is predicted to reduce waiting list mortality and increase overall population survival
    - The new scheme could save an additional 45 lives per year on the waiting list relative to current offering arrangements

4. Other aspects of offering will also change, e.g. proportional offering to VS

5. The new National Liver Offering Scheme will be introduced in March 2018

The New National Liver Offering Scheme

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Old scheme

Transplant centres are offered livers on a rota, the **local centre receives the first offer**

Centres are **ranked** based on recent **transplant activity**

Most centres then allocate the liver using the **UKELD score**

New scheme

Transplant Benefit Score (TBS)

The difference between expected survival with the transplant and expected survival whilst on the waiting list

Now includes:

- Dual listing for adult and paediatric organs
- Simultaneous liver and kidney registration
- Variant syndrome registrations
- Specific cancer patient matching

Why change?

- Improved equity of access across the UK
- Greater priority to those that will benefit the most
- To **maximise the survival** from the point a patient is registered

To achieve this, livers must be **offered to individual patients on a national level**

What changes?

New forms to capture the data needed for the TBS

3 month sequential data collection to keep the forms up to date

Liver offering to be completed by **ODT Hub Operations**

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