

NHS BLOOD AND TRANSPLANT

BOWEL ADVISORY GROUP

NATIONAL BOWEL ALLOCATION SCHEME – A PROPOSED SCHEME FOR THE UK

The aim of the scheme

The 2011 National Bowel Allocation Scheme (NBAS) is designed to allocate deceased donor organs to patients listed nationally for grafts containing the intestine using an objective and clinically appropriate allocation system. The current need for intestinal transplantation is approximately 25-30 grafts per year, with half of these patients requiring a combined liver and intestinal transplant. This has implications for allocation of other transplant organs.

Which organs are offered through this scheme?

This scheme covers the allocation of all donor organs or combination of donor organs that include the intestine. These comprise donor organs suitable for patients requiring intestine only, multivisceral (liver, bowel, pancreas, with or without stomach), modified multivisceral (bowel, stomach, pancreas) or intestine together with any combination of kidney or pancreas transplantation.

A “**bowel graft**” is defined as a graft that may contain any or all of the following parts of the GI tract: stomach, duodenum, jejunum, ileum, colon. A very small number of patients with abdominal wall loss or limited abdominal domain may also be listed to require an abdominal wall graft as well, in addition to a bowel graft.

Which patients qualify for inclusion within this scheme?

Potential recipients are assessed in designated centres and, if transplantation is clinically indicated, added to the national bowel transplant list. Adult transplant patients are discussed at the National Adult Small Intestinal Transplant Forum (NASIT). Paediatric patients are discussed at the multidisciplinary meetings at the two paediatric intestinal transplant centres. Patients may be added to the active national transplant list for any combination of intestinal transplant with or without other abdominal organs.

Super-urgent liver/intestine transplantation

A recent case in the UK identified the need for super-urgent allocation of a multivisceral graft containing the liver, bowel and pancreas. Following this the Bowel Advisory Group has agreed to list and prioritise patients with acute liver failure and intestinal failure or extensive porto-mesenteric venous thrombosis. These super-urgent patients would have the same priority and status as current patients listed to receive emergency liver transplants for acute liver failure or acute liver graft failure,

and ahead of all patients listed to require any type of intestinal containing graft. This additional category would have to be agreed to by the Liver Advisory Group to NHSBT.

Donor - recipient blood group criteria

Donor to recipient blood group matching is preferable for the following reasons:

1. To maintain equity of access to a transplant for patients across all blood groups and, in particular, to minimise the disadvantage to blood group O patients (blood group O donor organs are compatible with all blood group patients).
2. Transplantation between compatible but non-identical blood groups may result in increased risk of graft-versus-host disease, including immune-mediated haemolytic anaemia.

However, in cases where the patient has an uncommon blood group this rule should not apply, so a blood group AB patient may receive a blood group A intestine and a blood group B patient may receive a blood group O intestine. Additionally, in the event that organs cannot be placed identically then transplantation between compatible blood groups is allowed.

<i>Donor blood group</i>	<i>Potential recipient blood group</i>			
	O	A	B	AB
O	a		a	
A		a		a
B			a	
AB				a

Prioritisation of patients – the points system

A ranked priority will be calculated for all patients on the national transplant list using a points system, along similar lines to that used for the prioritisation of kidney and pancreas patients. When a donor becomes available that is suitable for the purposes of intestinal transplantation, all eligible patients on the national transplant list are given points based on several criteria and the total score is used for ranking. Given the small number of intestinal transplants performed worldwide, there are limited data on the weighting of the different factors considered for the proposed scoring system. The proposal at the Bowel Advisory Group was to introduce this scheme on the basis of best knowledge available and audit outcomes annually with a view to revising the document on a two yearly basis.

Several factors determine the suitability of a donor for a particular bowel transplant patient. The key issue relates to size mismatch especially for patients with short gut

as an indication for intestinal transplantation. Approximately half of all children waiting for an intestine containing transplant weigh 10 kg or less and it is this group that experiences the largest discrepancy between donor and recipient organ availability. Most paediatric donors are larger children or teenagers, so the paediatric transplant centres need to consider reduction of these grafts prior to implantation into the smaller patients.

The highest risk of mortality on the transplant list is for patients with advanced liver disease accompanied by small recipient size. Markers of advanced liver disease in patients with intestinal failure are different from end-stage cirrhosis and include: high serum bilirubin (level > 200 µmol/l associated with increased mortality), low platelet count. These may occur in the absence of coagulopathy and hypoalbuminaemia. For this reason, it is unlikely that existing liver disease assessment scores like MELD (Model for End-stage Liver Disease score) and UKELD (UK End-stage Liver Disease score), currently used to prioritise adult elective liver transplant patients will be able to be applied to this population of patients.

The international Intestinal Transplant Registry (ITR) has identified three factors associated with favourable outcomes after intestinal transplantation and these are:

1. Transplantation from home.
2. Increased experience of the transplant centre.
3. Intestinal transplantation without liver transplantation.

The ITR has also demonstrated that in patients who have survived a year after transplant, there is a liver protective effect with significantly better long term survival in recipients of grafts containing the liver compared to those intestinal grafts transplanted without a liver.

Donor to recipient age matching points

‘Paediatric donors’ are defined as those aged up to 16 years.

‘Paediatric recipients’ are defined as those aged up to 18 years.

‘Adult recipients’ are defined as those aged 18 years or more.

‘Adult recipients’ with a weight less than or equal to 35 kg may be listed on the paediatric transplant list as it is almost impossible to find size matched donors from the adult donor pool. As at 27 June 2011, no adults listed weighed ≤ 35 kg.

<i>Donor</i>	<i>Recipient</i>	<i>Points</i>
Paediatric	Paediatric	1000
Adult	Adult	500
Adult	Paediatric	250
Paediatric	Adult	0

Waiting time points

Patients on the transplant list receive one point for each day on the transplant list. Points start to be accrued only when the patient is activated on the transplant list for the first time, but continue to be accrued during periods when the patient is subsequently inactivated/suspended.

Urgency points

Patients awaiting intestinal transplantation vary in urgency and it is appropriate that this should be reflected in the prioritisation scheme. The following table lists the additional points allocated for specified urgency criteria. If a patient satisfies more than one of these criteria then the points allocated for each of the urgency criteria satisfied will be added together to give the total points allocated for 'Urgency'.

<i>Urgency criterion</i>		<i>Points</i>
Loss of intravenous line access	Single access site remaining	1000
Liver failure	Serum bilirubin of 200 $\mu\text{mol/l}$ or greater	1500
	Serum bilirubin of between 100 and 200 $\mu\text{mol/l}$	750
Diagnosis of malignancy		500
In-hospital status		500

These data are collected on the Intestinal Failure Transplant Recipient Registration form at the time of registration. It is expected that these data will be collected on a monthly basis while the patient is registered on the transplant list.

Requirement for other organs points

Some patients on the transplant list for intestinal transplantation require organ transplants in addition to the intestine; this has an effect on transplant list prognosis and is, therefore, reflected in the points allocated as follows. If a patient requires a combination of organs then the points allocated for each additional organ required will be added together to give the total points allocated for 'Requirement for other organs'.

<i>Additional organ required</i>	<i>Points</i>
Liver	300
Kidney	200
Pancreas	100
Abdominal Wall	100

The preferred allocation of renal and pancreatic donor organs to patients listed for intestinal transplantation is currently based on an individual patient's need. Parallel to adoption of this points allocation system, there is a need for this to be discussed and agreed to by both the Kidney and Pancreas Advisory Groups to NHSBT, similar to the agreements reached with the Liver Advisory Group for liver allocation.

Sensitisation points

Potential recipients may have pre-existing HLA antibodies as a result of exposure to the different HLA antigens through blood transfusion, previous transplants and pregnancy. The precise significance of HLA antibodies in intestinal transplantation remains a matter of debate, but it is more likely that transplantation that is carried out in the presence of donor-reactive antibodies will be complicated by rejection and poorer outcome (although there is no evidence that hyper-acute rejection occurs as in kidney, heart and lung transplants).

It is desirable that, as far as possible, organs are allocated in such a way as to maximise the probability that patients with high levels of sensitisation receive donor organs with a negative cross-match. For this reason, patients on the transplant list are given points in proportion to the level of sensitisation, as shown in Figure 1, Appendix 1 (taken from pancreas allocation algorithm). The aim is to maximise the chance of patients with high levels of sensitisation receiving the offer when an HLA compatible donor becomes available. This is particularly important for patients with high levels of sensitisation and does not unduly affect patients with low levels because they are HLA compatible with a much larger pool of donors.

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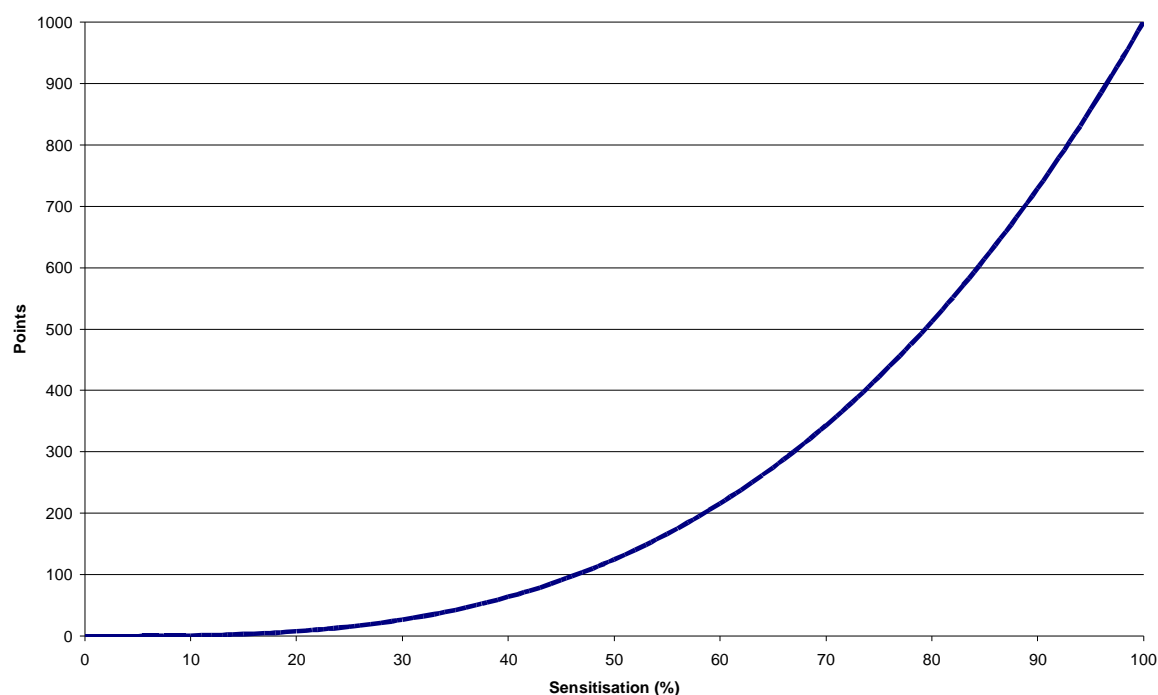
APPENDIX 1 CALCULATING THE TOTAL POINTS SCORE (TPS)

TPS	=	Donor to recipient age matching points:	
		Paediatric donor to paediatric recipient	= 1000 points
		Adult donor to adult recipient*	= 500 points
		Adult donor to paediatric recipient	= 250 points
		Paediatric donor to adult recipient*	= 0 points

* Note Adult recipients with a weight less than or equal to 35 kg may be listed on the paediatric transplant list as it is almost impossible to find size matched donors from the adult donor pool.

+	Waiting time points:	
	Waiting time in days	
+	Urgency points:	
	Loss of intravenous line access (single access site remaining)	= 1000 points
	Liver failure (serum bilirubin of 200 µmol/l or greater)	= 1500 points
	Liver failure (serum bilirubin of between 100 and 200 µmol/l)	= 750 points
	Diagnosis of malignancy	= 500 points
	In-hospital status	= 500 points
+	Requirement for other organs points:	
	Liver	= 300 points
	Kidney	= 200 points
	Pancreas	= 100 points
	Abdominal wall	= 100 points
+	Sensitisation points:	
	(See Figure 1)	$\frac{\text{Sensitisation (\%)}^3}{1000}$

Figure 1 Sensitisation points taken from the pancreas allocation algorithm



APPENDIX 2 TOTAL POINTS SCORE EXAMPLES

Assume compatibility of blood groups between donor and patient.

Donor 1 details: Aged 8 years, donation after brain death donor

Donor 2 details: Aged 45 years, donation after brain death donor

Patient 1 details: Aged 4 years, waiting 724 days, cRF 0%, serum bilirubin of 451 µmol/l, requires liver and pancreas, in hospital

Patient 2 details: Aged 36 years, weight 35 kg, waiting 611 days, cRF 80%, serum bilirubin of 13 µmol/l, requires kidney, in hospital, loss of intravenous line access

Patient 3 details: Aged 16 years, waiting 252 days, cRF 10%, serum bilirubin of 12 µmol/l, requires no additional organs (bowel only)

Patient 4 details: Aged 45 years, weight 55 kg, waiting 165 days, cRF 25%, serum bilirubin 102 µmol/l, requires liver, kidney and pancreas, diagnosis of malignancy, in hospital

Total Points Score Calculation Examples

Points score								
Factor	Patient 1		Patient 2		Patient 3		Patient 4	
	Donor 1	Donor 2	Donor 1	Donor 2	Donor 1	Donor 2	Donor 1	Donor 2
Age match	1000	250	1000	500	1000	250	0	500
Waiting time	724	724	611	611	252	252	165	165
Urgency:								
Loss of intravenous line access	0	0	1000	1000	0	0	0	0
Liver failure	1500	1500	0	0	0	0	750	750
Diagnosis of malignancy	0	0	0	0	0	0	500	500
In-hospital status	500	500	500	500	0	0	500	500
Other organs required	400	400	200	200	0	0	600	600
Sensitisation	0	0	512	512	1	1	16	16
Total Points Score (TPS)	4124	3374	3823	3323	1253	503	2531	3031

Bowel Matching Run Result Examples

Patient	TPS (Donor 1)	Rank (Donor 1)	Patient	TPS (Donor 2)	Rank (Donor 2)
1	4124	1 (First offer)	1	3374	1 (First offer)
2	3823	2 (Second offer)	2	3323	2 (Second offer)
4	2531	3 (Third offer)	4	3031	3 (Third offer)
3	1253	4 (Fourth offer)	3	503	4 (Fourth offer)