

NHS BLOOD AND TRANSPLANT

2010 NATIONAL PANCREAS ALLOCATION SCHEME

THE SCHEME

The 2010 National Pancreas Allocation Scheme (NPAS) allocates donated pancreases to patients listed nationally using an objective, open, evidence-based and clinically appropriate allocation system.

Which donated pancreases are offered through this scheme?

Pancreases that are offered through this scheme include those donated after brain death (DBD) and those donated after cardiac death (DCD). Pancreases that are preferentially offered and accepted for multivisceral (e.g. pancreas and small bowel) or multiple organ transplants (e.g. pancreas and liver), with the exception of combined pancreas/kidney transplants, are not offered through this scheme.

Which patients qualify for inclusion within this scheme?

Potential recipients are assessed in designated units and, if transplantation is clinically indicated, they are added to the national transplant list. Patients may be added to the active national transplant list for any form of vascularised pancreas transplant including a combined pancreas and kidney, a pancreas transplant in someone who has previously had a kidney transplant (pancreas after kidney, PAK) and a pancreas transplant alone (PTA), as well as for pancreatic islet transplantation; all are considered concurrently within this scheme. Patients listed for a multivisceral or multiple organ transplant (with the exception of combined pancreas and kidney grafts) are not included within this scheme.

Donor - recipient blood group criteria

Donor to recipient blood group matching is prioritised as part of the scheme. This is important to maintain equity of access to a transplant for patients across all blood groups. For example: while pancreases from blood group O donors could be allocated to recipients of any blood group, blood group O recipients are only able to receive organs from blood group O donors for biological reasons. If all blood group O donor organs were allocated to recipients of any blood groups then the number of blood group O pancreases available to blood group O recipients would be much less and the blood group O recipients would be disadvantaged.

Where the recipient is very difficult to find a pancreas for because they are an unusual blood group this rule may be broken, so a blood group AB recipient may receive a blood group A pancreas and a blood group B patient may receive a blood group O pancreas. If there are no suitable patients that meet the blood group criteria then other compatible blood group matching is permitted. This includes allocating blood group O donors to blood group A, B (with a cRF < 75%) and AB recipients and B donors to AB recipients.

Donor blood group	Potential recipient blood group			
	O	A	B	AB
O	✓	-	✓*	-
A		✓		✓
B			✓	-
AB				✓

* Patients with a calculated reaction frequency of 75% or more only

- Permitted if there are no suitable patients that meet the blood group criteria

Prioritising kidneys between SPK and kidney only patients

Kidneys are allocated through the [National Kidney Allocation Scheme](#) with the exception of multivisceral and multiple organ transplants (including combined pancreas and kidney transplants).

When donor kidneys become available for transplant they are first offered for transplant through the National Kidney Allocation Scheme (NKAS). This scheme prioritises patients within five pre-defined tiers (A to E). Patients actively listed for a kidney only transplant ranked in Tiers A to C on the Kidney Matching Run will receive priority over all patients listed for a vascularised pancreas or pancreas islet transplant. If there is no more than one suitable kidney only patient listed within Tiers A to C, then one kidney may be offered with the pancreas within the National Pancreas Allocation Scheme for patients listed for a SPK transplant. Should the kidney not be allocated through NPAS, it will then be offered back through the NKAS to kidney only patients listed in Tiers D and E.

If both kidneys are allocated to kidney only patients listed within Tiers A to C of the NKAS, the pancreas will be offered in isolation through the NPAS but only patients listed for an isolated pancreas transplant or a pancreatic islet transplant will be considered.

Reallocation of the pancreas through centre choice

There are times when, due to unexpected circumstances, it not possible to transplant a pancreas in to the patient it had originally been accepted for. There are a number of reasons why this may occur for example an unexpected positive HLA cross match result may reveal that the organ is not clinically suitable for the intended patient or the patient may prove to be unfit for transplant at the time of the offer. In such circumstances, if the pancreas is in transit to or has been received by the accepting centre, the receiving transplant team may select the most appropriate alternative patient from their local list. This is known as a reallocated pancreas through centre choice. If there are no suitable alternative patients listed at the receiving centre then the pancreas will be 'Fast Tracked'.

The Fast Track Scheme

On some occasions a pancreas may be recovered from the donor before the organ has been accepted on behalf of a nominated patient. In such circumstances the offering process needs to be completed quickly, since optimal outcomes following transplantation require the pancreas to be out of the body for as short a time as possible. It is therefore necessary to override the standard allocation procedures and place the donated organ as a matter of urgency. On these rare occasions the 'Fast Track Scheme' is implemented. The pancreas is offered simultaneously, by way of fax, to all pancreas and islet transplant centres. Centres are then asked to respond within 30 minutes and definitively accept or decline the offer on behalf of any of their actively listed patients.

THE POINTS SYSTEM

In order to prioritise patients for receipt of a pancreas that becomes available, patients are awarded individual points based on a number of clinically relevant donor, patient and transplant related factors. For each patient these points are cumulated to give an individual Total Points Score (TPS). The patient with the highest TPS is ranked first on the offering sequence. All eligible patients appear on the Pancreas Matching Run (PMR) and are ranked according to the highest to lowest TPS.

The scoring system is based on a combination of donor, recipient and transplant factors. Patient scores and ranking positions will therefore differ over time and for each given donor. The algorithm that calculates the TPS is detailed in [Appendix I](#). An example of how the scoring system is used to prioritise patients is shown in [Appendix II](#).

Total HLA mismatch points

The HLA type ("Tissue type") in terms of HLA-A, B and DR antigens of both the donor and patient are recorded. Within each locus (eg HLA-A) there are many specific HLA antigens (eg A1, A2, A3 etc) and most donors/recipients will have two HLA antigens for each locus. Some patients are what is known as homozygous and may only have one common antigen within a locus.

These HLA antigens are compared between the donor and potential recipient and the numbers of antigens present in the donor that are not present in the recipient are counted. A patient can therefore have either zero, one or two mismatches at each locus. Across the HLA-A, B and DR loci the total mismatch count can therefore range between zero and six.

There is evidence to suggest that transplants with a very poor HLA match (total mismatch count of 5 or 6) may lead to poorer longer-term post-transplant outcomes compared with transplants with lower numbers of HLA mismatches. It is important to note that in some circumstances a poorly matched transplant may be a good option for the patient and may proceed. The HLA mismatch score aims to minimise the number of transplants with

very poor HLA matching without excluding them as an option for some patients.

It is also known that a number of routine pancreatic islet transplant recipients are likely to require a second or subsequent transplant as a priority. To increase the chance of finding an appropriate donor HLA match for the second or subsequent islet transplant, an additional HLA points system is applied to patients receiving their first islet transplant.

Waiting time points

For patients listed for a priority islet transplant, waiting times are calculated from the date of their previous islet transplant. All other waiting times are calculated from the date the patient was first registered on the active national pancreas transplant list. Both waiting time calculations include all days that a patient may have been temporarily suspended from the list.

Patients that require a priority islet transplant are awarded points using a different scoring system to all other patients listed for a routine islet or vascularised pancreas transplant. It is clinically preferable that priority islet patients receive their second or subsequent islet transplant within a short time of their first graft. Patients listed for a priority islet graft therefore accrue waiting time points considerably quicker than all other patients. The two points systems are shown in [Figure A](#) in [Appendix I](#).

Sensitisation points

Potential recipients can develop a number of different HLA antibodies as a result of exposure to the different HLA antigens through blood transfusion, previous transplants and pregnancy. Many patients, however, have no detectable HLA antibodies. If a potential recipient has an antibody to an HLA antigen then they cannot receive a transplant from a donor with that HLA antigen, thus restricting the pool of potential donors. Patients who are clinically incompatible with the donor are excluded from the pancreas matching run.

For a given patient with detectable HLA antibodies, the proportion of blood group identical donors from a pool of 10000 and for which they would be HLA incompatible is calculated. This percentage of donors is termed the 'calculated Reaction Frequency' (cRF), more commonly referred to as the sensitisation level. Patients with no detectable HLA antibodies will have zero sensitisation (0% cRF).

The allocation scheme prioritises patients according to their varying levels of sensitisation. The aim is to maximise the chance of patients with high levels of sensitisation receiving an offer when a pancreas from 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. The scoring system used is shown in [Figure B](#) in [Appendix I](#).

Travel time points

Once the pancreas has been recovered at the donor hospital, it is important to implant the organ as soon as possible. Although the intervening time is determined by a number of factors, the allocation scheme can help minimise this by minimising the transport time between the donor hospital and transplant centre.

There are eight designated pancreas transplant centres throughout the UK. Travel time points work differently for each type of donor and for patients listed for vascularised pancreas transplants and islet transplants, but as a general principle organs are not sent a long way for transplant unless necessary.

Donors after brain death

For potential recipients listed for a vascularised pancreas transplant, a computer programme automatically identifies the closest three transplant centres in relation to the donor hospital. Points are then awarded to all patients listed at any of those three closest centres. Potential recipients listed at any of the other five transplant centres are awarded zero travel time points. All patients listed for a routine islet transplant receive travel time points by default because all pancreases are sent to one of only three islet isolation laboratories prior to transplant.

Donors after cardiac death

Organs retrieved from donors after cardiac death are very sensitive to ischaemia (the time they are out of the body before being transplanted). It is therefore even more imperative to reduce the travel time for such pancreases. A considerably higher weighting is given to patients listed at the closest transplant centre to minimise the time these organs spend in transit. All patients listed for an islet transplant will only receive travel time points if one of the on-call isolation centres is within 150 miles of the donor hospital.

Donor Body Mass Index (BMI) points

The NPAS incorporates patients listed for both vascularised pancreas and islet transplantation. It is clinically desirable that pancreases from donors with a low BMI are used for vascularised pancreas transplantation and often a higher yield of pancreas islets can be extracted from pancreases recovered from a donor with a high BMI. There is also a range of donor BMIs that are considered clinically desirable for both types of transplant. The donor BMI scoring system is in place to account for each of these three considerations. The scoring system is shown in [Figure C](#) of [Appendix I](#).

Dialysis status points

Diabetes is often associated with chronic kidney disease (CKD) which can lead to kidney failure. The severity of CKD can be estimated and in the most severe cases will be treated with dialysis. Around 40% of pancreas transplant patients are listed approximately six months before they are expected to require dialysis. This is usually referred to as pre-emptive listing. Other patients may have been on dialysis for some time before being listed for transplant and these patients receive some degree of priority over those who are not yet on dialysis.

Donor to recipient age matching points

Although not clinically necessary, donor and recipient age matching has been included in the scheme as a tie breaker between patients with very similar scores. This factor is the least influential on the overall scores. The scoring system is shown in [Figure D](#) of [Appendix II](#).

TPS = **Total HLA-A, B & DR mismatch count points:**
 0 to 4 HLA mismatches = 730 points
 5 to 6 HLA mismatches = 0 points

+ For patients listed for first islet graft:

0 mismatches = 0
 1 to 2 mismatches = -150
 3 to 4 mismatches = -350
 5 to 6 mismatches = -700

+ Waiting time points (see Figure A):

For all vascularised and first islet grafts:

$$\frac{\text{Waiting time (days)}^2}{365}$$

For patients listed for a second islet graft:

$$365 + \frac{\text{Waiting time (days)}^2}{44.4}$$

+ Sensitisation points: $\frac{\text{Sensitisation (\%)}^3}{1000}$
 (see Figure B)

+ Dialysis points:

On dialysis = 180 points
 Not on dialysis = 0 points

+ Travel time points (Donor hospital to transplant centre)

For donors after brain death:

Closest three centres = 365 points,
 Centres outside closest three = 0 points,
 Routine islet patient (by default) = 365 points,
 Priority islet patients = 0 points

For donors after cardiac death:

Closest centre = 10,000 points,
 Closest three centre (excluding closest) = 5000 points,
 Centres outside closest three = 0 points,
 Within 150 miles of isolation lab* = 10,000 points

* NB All patients listed for a routine islet transplant will receive points if an isolation lab is within a 150 mile radius of the donor hospital. Oxford and the London isolation labs share an on-call rota, therefore the 150 mile radius is calculated based on a hospital halfway between the two (High Wycombe).

+ Donor BMI points (see Figure C):

Note: BMI is rounded to nearest whole number before points are awarded.

<i>Donor BMI</i>	<i>Vascularised</i>	<i>Islet</i>
22 or less	+730	-730
23 to 25	+365	-365
26 to 28	0	0
29 to 31	-365	+365
32 or over	-730	+730

- Donor to recipient age matching: $\frac{\text{Age difference (years)}^2}{13.9}$
 (See Figure D)

Figure A Points for waiting time to transplant (days)



Figure B Sensitisation points based on calculated reaction frequency

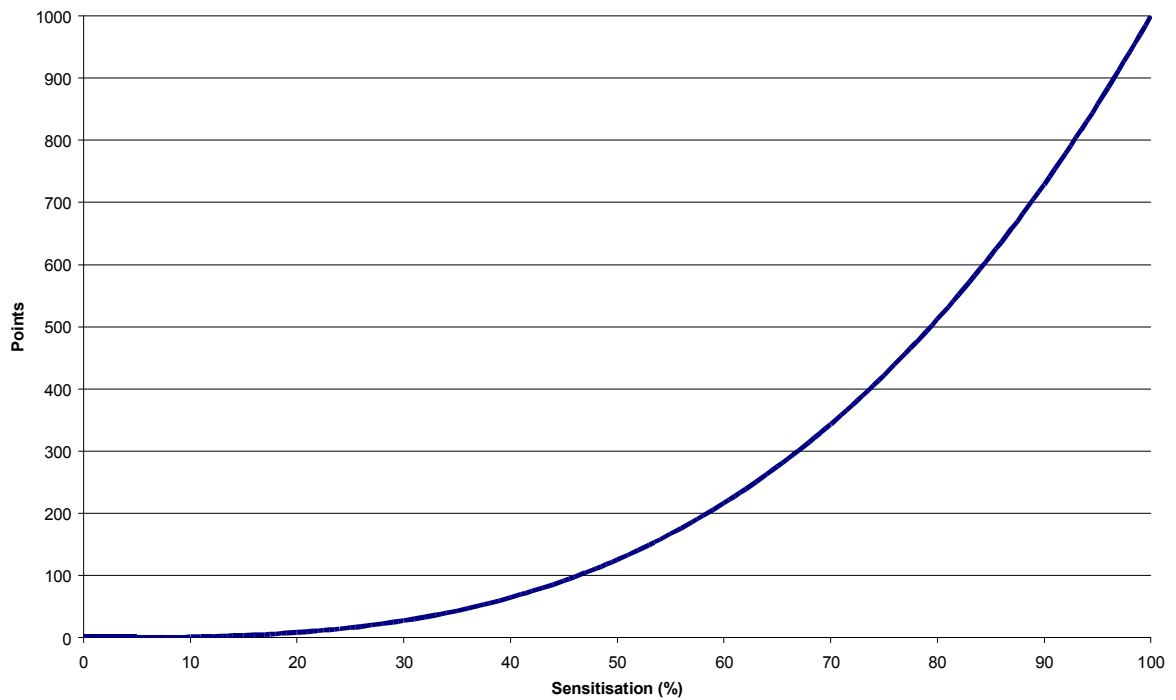


Figure C

BMI weighting for whole organ and islet patient points

Note: BMI is rounded to nearest whole number before points are awarded.

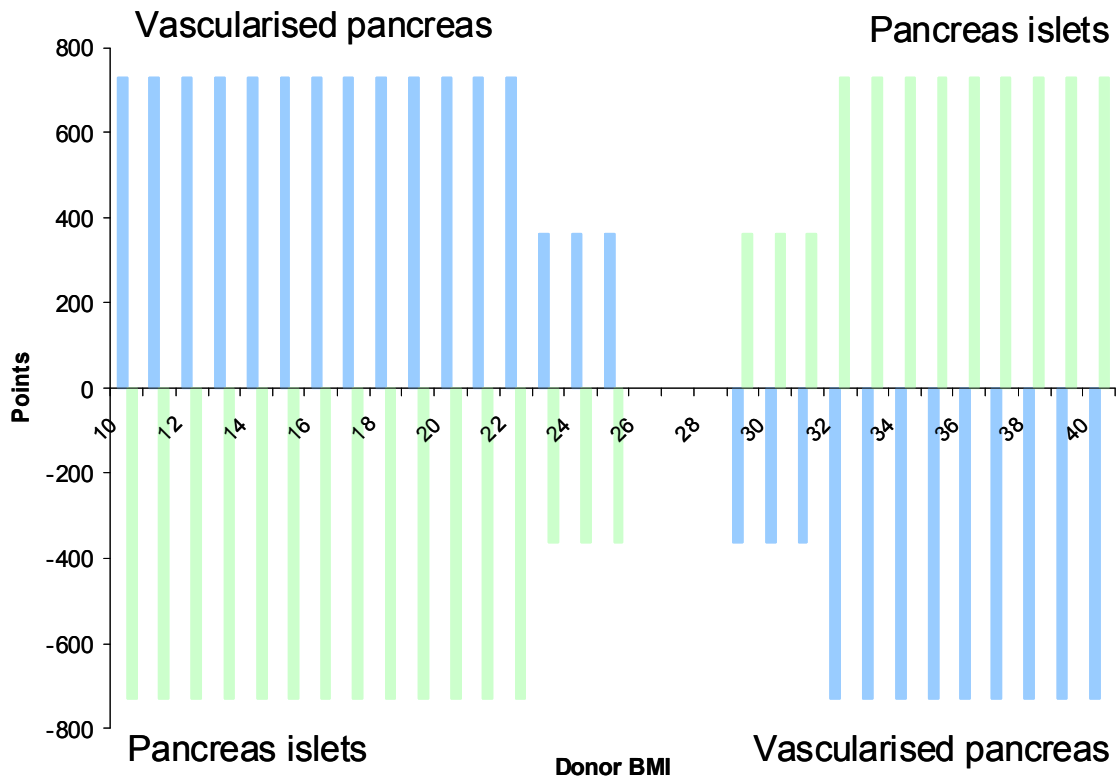
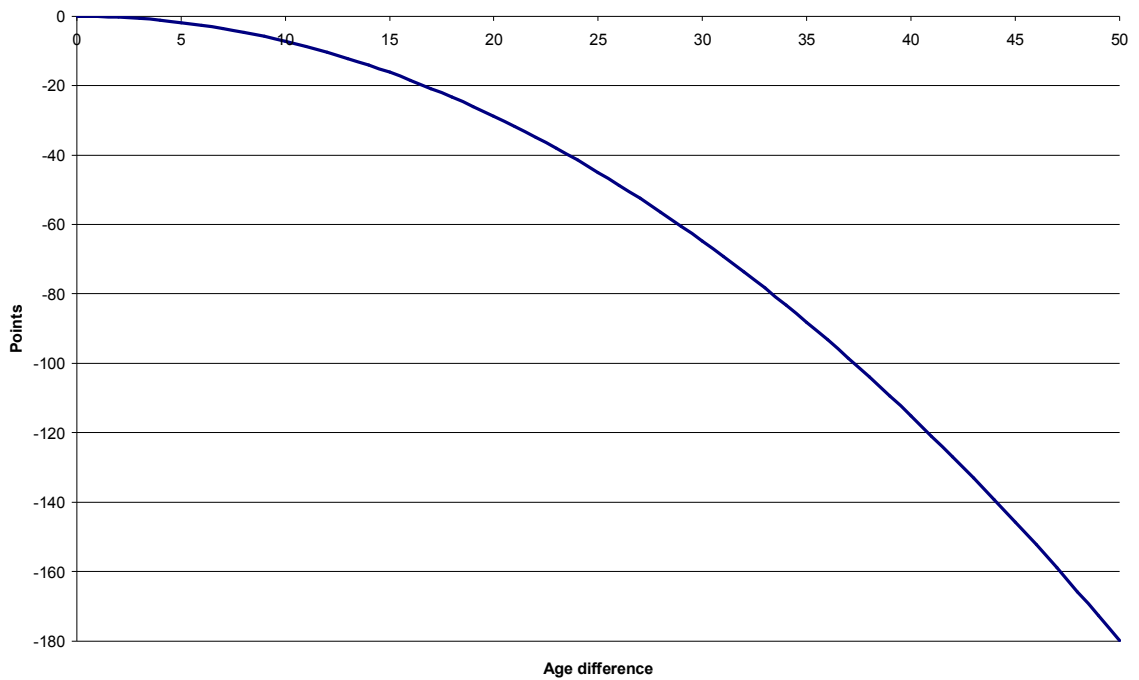


Figure D

Age matching points



APPENDIX II TOTAL POINTS SCORE EXAMPLES

Donor details: Aged 45 years, BMI 30, Churchill Hospital, Oxford, donor after brain death

Patient A details¹: Requires a vascularised pancreas, listed at Oxford for 200 days, cRF 85%, on dialysis, aged 40 years

Patient B details¹: Requires a priority islet graft, cRF 0%, listed at Newcastle for 50 days, not on dialysis, aged 35 years

Patient C details¹: First islet graft, listed at Oxford for 300 days, cRF 10%, not on dialysis aged 55 years

¹ Assuming all have less than five HLA mismatch counts with the donor

Total Points Score Calculation Examples

Factor	Patient A	Points Score Patient B	Patient C
HLA MM score	730	730	730
First islet MM score	N/A	N/A	-350
Waiting time	110	421	247
Sensitisation	614	0	1
Dialysis status	180	0	0
Travel time points	365	365	365
Donor BMI index	-365	365	365
Age match	2	7	7
Total Points Score (TPS)	1636	1888	1365

Pancreas Matching Run Result Example:

Patient	TPS	Rank
B	1888	1 (First offer)
A	1636	2 (Second offer)
C	1365	3 (Third offer)

Commentary

In this example, the pancreas would be offered first to the transplant team responsible for Patient B. They may choose to accept or reject the offer on behalf of that patient. If declined, the transplant team responsible for Patient A will receive the next offer and so on.