NHS BLOOD AND TRANSPLANT

KIDNEY OFFERING SCHEME WORKING GROUP

ENDORSEMENT OF A NEW NATIONAL KIDNEY OFFERING SCHEME

INTRODUCTION

- 1 Three working groups were established to consider whether changes were required to the 2006 UK Kidney Allocation Scheme to reflect the increased use of donors after circulatory death (DCD) and generally older, more challenging donor kidneys.
- 2 The working groups agreed that a new Kidney Offering Scheme should be introduced to better match patient and graft life expectancy, to give more priority to difficult to match patients and, where HLA matching is deemed appropriate, all loci should be considered (HLA-A, B, Cw, DR,DQ).

CONSULTATION

3 The proposed kidney offering scheme was disseminated for a final consultation period on 19 April 2018 and closed on 31 May 2018. Included in this paper is the information that was shared during the consultation.

ACTION

4 Members of the Kidney Advisory Group are asked to consider this information and, if appropriate give their final endorsement.

Lisa Mumford Statistics and Clinical Studies

May 2018

KAG(18)8



Fox Den Road Stoke Gifford Bristol BS34 8RR

19 April 2018

Dear Colleagues

Re: Proposed Deceased Donor Kidney Offering Scheme Consultation

A new kidney offering scheme has been designed to help improve equity of access for difficult to match patients and reduce the number of unsuitable patient specific kidney offers that transplant centres receive.

The proposed scheme has been presented at many meetings and events over the last few years, including the British Transplantation Society Congresses in 2017 and 2018, The Renal Transplant Services Meeting in 2017 and 2018 and at the Kidney Advisory Group Meetings over the last few years where colleagues in the transplant community and patient groups have had a chance to comment. The most recent presentation at the BTS conference is available on the YouTube NHSBT channel here: https://youtu.be/iOyeGPh85K0.

If you were unable to attend any of these events and would like to make any final comments on the proposed scheme then we ask that you complete the Survey Monkey via the following link: <u>https://www.surveymonkey.co.uk/r/M6BFSPN</u>. The survey will be open until 31st May 2018 and responses collated and presented at the Kidney Advisory Group Meeting on 7th June 2018 for final sign off.

Attached to this letter is a 2-page summary of the proposed kidney offering scheme, the allocation scheme principles and a frequently asked questions and answers sheet.

For any further information, please contact us via email at Lisa.Mumford@nhsbt.nhs.uk.

Yours sincerely

Chris Watson Chair – Kidney Advisory Group

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Lisa Mumford Principal Statistician - NHSBT

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Working towards a new Kidney Offering Scheme

Introduction

In 2015, three working groups were established to consider whether changes were required to the 2006 UK Kidney Allocation Scheme to reflect the increased use of donors after circulatory death (DCD) and generally older, more challenging donor kidneys. The three groups were tasked with reviewing the current scheme, looking at philosophy of allocation and looking at histocompatibility and immunogenetics, respectively. The working groups agreed that a new Kidney Offering Scheme should be introduced to better match patient and graft life expectancy, to give more priority to difficult to match patients and, where HLA matching is deemed appropriate, all loci should be considered (HLA- A, B, Cw, DR, DQ).

Materials and Methods

In line with agreed objectives, a series of computer simulations were used to explore a number of different offering scheme algorithms. The simulations were developed using 4100 UK deceased kidney donors that resulted in a transplant between 2013 and 2016, and 5300 patients listed in the UK for a kidney only transplant at 1 January 2012 and 8200 patients newly listed for a kidney only transplant, between 2012 and 2016. Each simulation represented four years of constant activity. Simulation results of different possible schemes were compared according to characteristics of the simulated transplant and waiting list pools in order to find the best compromise between competing objectives. The simulations included use of donor and recipient risk indices developed with the working groups.

Key Objectives

- Unify DBD and DCD offering with all DBD and DCD kidneys allocated through scheme
- More effective 'quality' matching between donor and recipient
- Better tailored HLA matching by age
- Geographical equity of access
- Avoid prolonged waiting times that are predictable
- Waiting time from earliest of start of dialysis or activation on the list
- Age should be a continuous factor

2006 Kidney Allocation Scheme

- All DBD donors allocated by national rules:
- Tier A Paediatric patients 000: HSP or HLA-DR homozygous
- Tier B Paediatric patients other 000
- Tier C Adult patients 000: HSP or HLA-DR homozygous
- Tier D Adult patients—other 000 + Paediatric patients (100, 010, 110)
- Tier E All other patients

Within Tiers patients prioritised by a points score including; Waiting time, tissue match and age combined, age difference, location, blood group match

Proposed offering scheme

All deceased donors allocated by national rules:

- Tier A Patients with matchability score=10, 100% cRF or ≥7 years waiting time
- Tier B All other patients

Tier A patients prioritised by waiting time and Tier B patients prioritised by a points score including; donor-recipient risk index combinations, waiting time from earliest of dialysis or activation on the list, tissue match and age combined, location, matchability, total mismatch, blood group match

Working towards a new Kidney Offering Scheme

Blood and Transplant

Simulation results



Conclusion

A new Kidney Offering Scheme in the UK is being developed to reflect the changing donor pool and to address some of the inequities observed in the current scheme (introduced in 2006). The new scheme will allocate all kidneys from both DBD and DCD donors and will more effectively match graft life expectancy with patient life expectancy.

Allocation scheme principles

1.1 Patient prioritisation

All kidneys from deceased donors to be allocated via an evidence-based computer algorithm unless donor is classed as D4 and aged over 70. This is based on two ranked Tiers of recipients who are eligible (as defined below) to receive a particular donor's organs:

Tier A	Patients with matchability score = 10* or Patients with 100% calculated reaction frequency* or	
	Patients that have accrued 7 years of waiting time	
Tier B	All other eligible patients	

*(based on comparison with pool of 10,000 donor HLA types on national database)

Within Tier A, patients are prioritised according to matchability score and waiting time. Within Tier B, patients are prioritised according to a points-based system (highest score first), based on 8 elements, these include:

- Waiting time from earliest of start of dialysis or activation on the list
- Donor-recipient risk index combinations
- HLA match and age combined
- Location of patient relative to donor
- Matchability
- Donor-recipient age difference
- Total HLA mismatch
- Blood group match

Waiting times

Number of days waiting time accrued.

Waiting time is determined from date of starting permanent dialysis (HD or PD) or date of first active listing for a graft, whichever is earliest. Each day accrues 1 point, including all days of suspension from the list.

Any patient whose previous graft failed within the first 180 days post-transplant starts with a waiting time as it was on the day of that (failed) transplant. The failure must be reported to NHSBT through a follow-up return to enable the waiting time to be calculated accurately.

Waiting time is transferable when a patient transfers from one transplant centre to another. The time will be calculated automatically provided the patient has not been 'removed' from the list as part of the transfer.

Donor-recipient risk index combinations

A donor risk score (DRI) is calculated for each donor on offer using 7 risk factors. A donor is then categorised in to one of 4 groups based on the risk score and by pre-determined cut-off values. D1 (lowest risk), D2, D3 and D4 (highest risk).

DRI	=	exp {	0.023 x (donor age-50)	+
			-0.152 x ([donor height-170]/10)	+
			0.149 x (history of hypertension)	+
			-0.184 x (female donor)	+
			0.190 x (CMV +ve donor)	+
			-0.023 x ([offer eGFR-90]/10)	+
			0.015 x (days in hospital)	}
D1		≤ 0.79		
D2		0.79 –	1.12	
D3		1.12 –	1.50	
D4		≥1.50		

A recipient risk score (RRI) is calculated, for each eligible patient using 4 risk factors. A recipient is then categorised in to one of 4 groups based on the risk score and by predetermined cut-off values. R1 (lowest risk), R2, R3 and R4 (highest risk).

RRI	=	exp {	0 x (recipient age≤25)-50)	+
			0.016 x ((recipient age>25)-50)	+
			0.361 x (recipient on dialysis at registration)	+
			0.033 x ([waiting time from dialysis-950]/365.25)	+
			0.252 x (Diabetic recipient)	}
R1		≤ 0.74		

- R3 0.94 1.20
- R4 ≥1.20

Points are defined as:

Donor Risk	Recipient Risk Group			
group	R1	R2	R3	R4
D1	1000	700	350	0
D2	700	1000	500	350
D3	350	500	1000	700
D4	0	350	700	1000

HLA match and age combined

Points are defined as

- Level 1 = 3500 / (1 + (age / 50)5)
- Level 2 = 2250 / (1 + (age / 50)6)
- Level 3+4 = 500 / (1 + (age / 50)7)

Points scored are illustrated below, and mismatch levels are shown in Table C



Location of patient relative to donor

Each donor hospital will be allocated to one of four regions, based on their designated centre as follows:

North	Midlands	South West	London
Edinburgh	Birmingham	Bristol	GOSH
Glasgow	Cambridge	Cardiff	Guy's
Leeds	Coventry	Oxford	The Royal Free
Liverpool	Leicester	Plymouth	The Royal London
Manchester	Nottingham	Portsmouth	St George's
Newcastle	Sheffield		WLRTC
	Belfast		

Points are allocated based on the location of the potential recipient as follows:

For donors after brain death:

Within region	=	500 points
Within centre	=	0 points

For donors after circulatory death:

Within region	=	1000 points
Within centre	=	250 points

Matchability

Points are defined as: 40 * (1+ (Match score / 4.5)^{4.7})

Points scored are illustrated below



Donor-recipient age difference

Age difference points = $-\frac{1}{2}$ (donor-recipient age difference)²

For example, for a donor aged 60 and a potential recipient aged 20, 800 points are subtracted from the points total for the potential recipient.

Total HLA mismatch

A total mismatch score is calculated based on the number of mismatches at HLA-A, B, Cw, DR and DQ.

Total HLA mismatch = 0	0 points
Total HLA mismatch = 1	-100 points
Total HLA mismatch = 2-3	-150 points
Total HLA mismatch = 4-8	-250 points
Total HLA mismatch = 9-10	-500 points

Blood group match

-1000 points are allocated for blood group B patients when the donor is group O (Tier B only).

D4 donors aged 70 and over

To optimise the utilisation rate of higher risk older donor kidneys available for transplantation, both kidneys from donors categorised as D4 and 70 years or older will be offered as dual kidneys to the centre with the highest priority patient listed (according to the National Kidney Offering Scheme) although that centre may transplant the kidney(s) in to any locally listed patient.

1.2 Patient eligibility criteria

Eligibility criteria are primarily based on blood group and HLA match between donor and potential recipient.

Blood group eligibility

Patients with blood groups incompatible with the donor's blood group (as defined in Table A) are not eligible to receive that donor's organs. There are restrictions on blood group-compatible (but not blood group identical) patients, detailed in Table A.

Table A	Donor – recipient l	blood group matchi	ng policy	
Donor	0	Recip	pient	15
	0	A	В	AB
0	\checkmark	✓*	\checkmark	√ *
А		\checkmark		\checkmark
В			\checkmark	
AB				\checkmark
* Tier A only				

HLA match eligibility

Donors are HLA-typed at the local H&I laboratory according to the minimum resolution specification agreed by the NHBST Kidney Advisory Group and are reported to Hub Operations by secure fax.

Patients with HLA types that are not compatible with the donor's HLA type are not eligible to receive that donor's organs. Recipient antibodies reported at the HLA-A, B, Cw, DR and DQ loci are considered.

The HLA match between donor and recipient is determined on the basis of the HLA-A, B, C, DR and DQ loci only. The numbers of unique, broad level donor antigens not present in the recipient are counted to determine the HLA mismatch and mismatch level upon which points are based. This is done on the basis of defaulting rare HLA specificities to more common equivalents. The rare antigens and equivalents that are considered are shown in Table B.

The rare specificities indicated are defaulted to their more common equivalents so that patients with rare tissue types match with more donors. The defaults are applied (as appropriate) at NHSBT as part of the allocation algorithm. This enables patients with rare specificities also to be considered a match should a donor with the same rare specificities become available.

HLA mismatch grades are determined and then categorised as shown in Table C. Patients with a level 4 HLA mismatch with the donor are not eligible to receive the donor's organs through the national allocation scheme if the recipient has a matchability score 7 or less.

Table B	Defaulting of rare HLA specificities
Rare specificity	Common equivalent
A36 A80 A43 B53 B41 B42 B46 B47 B48 B59 B67 B70 B73 B78 B81 B82	A1 A1 A10 B5 B40 B7 B15 B27 B40 B8 B22 B35 B7 B35 B7 B35 B7 B12
B83 DR103 DR10	B12 DR1 DR1
DR9 DR11, DR12	DR4 DR5

Table (Table C HLA mismatch levels for HLA-A, B and DR				
Level	HLA mismatch summary	HLA mismatch combinations included			
1 2 3 4	000 [0 DR and 0/1 B] or [1 DR and 0 B] [0 DR and 2 B] or [1 DR and 1 B] [1 DR and 2 B] or [2 DR]	000 100, 010, 110, 200, 210, 001, 101, 201 020, 120, 220, 011, 111, 211 021, 121, 221, 002, 102, 202, 012, 112, 212, 022, 122, 222			

1.3 Additional considerations for paediatric patients

Older donors

Paediatric patients and young adults (< 18 years at time of active listing) will not be considered for kidneys from donors over 50 years of age.

Clinically urgent paediatric patients

A child may be priority listed for the next eligible blood group compatible donor, aged 50 years and under, regardless of match grade, in the following situations:

- In the event of potential imminent or actual loss of dialysis access without which the child will not survive
- In a child
 - o With functioning dialysis but no alternative dialysis access
 - o And where dialysis access in likely to become difficult within a short period
 - And when special restrictions are required for a suitable kidney (e.g. size due to anatomical difficulties in the recipient), which significantly restricts the possibility of an appropriate donor.
- Options for live related donation have been excluded

Before a child is priority listed an independent review should be carried out by two clinicians from different transplant centres to where the child is listed.

Frequently Asked Questions - Centres

Will changing waiting time from point of activation to start of dialysis disadvantage patients that are registered pre-emptively?

Several simulations were produced to examine the effect waiting time from start of dialysis would have on pre-emptive patients. The simulations showed that there would be little impact on pre-emptive patients with the proportion receiving a transplant in the simulation falling from 15% to 12%.

Is there a chance for gaming the system by calculating waiting time from activation for pre-emptive patients?

There will be a new quarterly report where we will monitor this closely using data form the UK Renal Registry. These reports will be sent to centres, appear in the annual reports and also be tabled at the Kidney Advisory Group. This will go some way to identify where centres will possibly be gaming the system for pre-emptive patients as we can highlight those patients that have been on the list for more than 6 months where dialysis still has not been started.

With the new scheme, Tier A patients get maximum priority. What stops centres from listing additional unacceptable antigens so that the patient appears as a matchability =10 or 100% cRF?

In the proposed scheme patients will get high priority if they are very difficult to match defined as having a list of defined unacceptable antigens or a rare HLA type or a combination of the two. If a centre decided to report extra unacceptable antigens to NHSBT then they are also reducing the chance of transplant of the patient as by definition a difficult to match patient will find it difficult to match with a donor. It is anticipated that only 15% of transplants will occur in Tier A and this will be monitored.

You've acknowledge that some recipients are going to be disadvantaged by the new scheme, how can we justify this to individual patients waiting for a kidney?

The proposed scheme is designed to be equitable across many patient groups. Patients with a shorter life expectancy will be offered kidneys with an increased risk of failure to reduce the number of functioning graft-years lost. We believe this is a better use of a scarce resource.

Has the impact of the new scheme been modelled by transplant centre? Will there be significant winners and losers?

In the first few years after implementation of the scheme there will be increased transplant activity for centres that have ethnic diversity on their waiting lists as well as centres with very difficult to match patients and patients with extended waiting times. This will address the inequities in the current system. After this initial settling in period transplant centres should receive offers in line to the proportion of patients that are registered on their waiting list. For example, if your centre has a 5.1% proportion of the UK waiting list then you should receive 5.1% of all offers in the UK. This should be a similar proportion to the number of offers received under the 2006 Kidney Allocation Scheme.

Given falling waiting times, should we change the criteria for entry into the new Tier A from a waiting time of over 7 years to a waiting time of over 5 years?

The new scheme will hopefully reduce the number of patients having to wait extended periods of time by giving priority to patients that have predicted long waiting times. This will be reviewed in the first few years after the introduction of the scheme and if it is felt that it would be beneficial to reduce the entry criteria in Tier A then this will be reviewed.

What are the timescales for the new Kidney Offering Scheme?

Consultation will run until 11th May 2018 with final sign-off of the proposed scheme at the Kidney Advisory Group on 7th June 2018. NHSBT plan to begin development of the scheme in July 2018 and complete this no later than March 2019 with a go-live date yet to be set.

Can I still use local DCD kidneys in a patient of my choice?

No, all kidneys, except those from donors who are classed as D4 and aged 70 years or over, will be offered to named patients via the kidney matching run for use in a specified patient. Any donor that is classed as D4 and aged 70 or over will be offered as two kidneys to be used either as dual or singly in a patient(s) of your choosing. DBD and DCD Kidneys offered through the fast track scheme an still be used in a patient of the centre's choice.

By removing priority for paediatric patients does this mean that waiting times for these patients will increase?

Under the proposed scheme, Tiers A-C will be removed and paediatric patients will appear alongside adult patients in the new Tier B. Simulations have shown that there will be no increase in waiting time for these patients because of the way the points score is calculated and will mean less of a difference in waiting time for patients registered on their 17th birthday compared to patients registered on their 18th birthday. This will be monitored closely in the first year.

The new scheme reduces the number of 000 mismatched transplants. Does this have an impact on survival?

The scheme reduces the priority given for 000 mismatched transplants especially in older patients where HLA match is less important. For younger patients, although there will be fewer 000 mismatched grafts there will be an increase in well matched grafts with better age matching. Patients will still be able to request a minimum match grade at listing which can be changed at any point, however limiting the match grade will result in fewer kidney offers. Simulations suggest that survival will be equivalent in the proposed scheme compared to the current scheme.

Will cold ischaemia time be taken in to account when matching DCD donors to recipients through the proposed scheme?

There is a location factor in the proposed scheme such that DCD donor kidneys are more likely to stay within the four regions used in the current DCD allocation scheme and only be shipped outside of these areas if there is a high priority patient (Tier A). There are a small number of points given for DCD kidneys to stay locally and these will be used to avoid shipping the kidney if there are two patients at the top of the matching run that have similar characteristics but one is closer to the donor than the other.