NHS Blood and Transplant

Proposed Kidney Offering Scheme

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On behalf of the Kidney Offering Scheme working group

BTS Congress, March 2018

Caring Expert Quality
Three small words, one big difference

Outline

NHS Blood and Transplant

- Background
- Donor and Recipient risk indexes
- Proposed kidney offering scheme
- Simulation results
- Additional considerations

Background

NHS Blood and Transplant

- Kidney Advisory Group reviewed 2006 Kidney Allocation Scheme to identify if a change was needed
- Three working groups were set up to look at:
  - Design and review of Kidney Offering scheme
  - Philosophy of Allocation
  - HLA Working group
- Donor and Recipient Risk index have been developed to inform future scheme

Summary of the 2006 KAS

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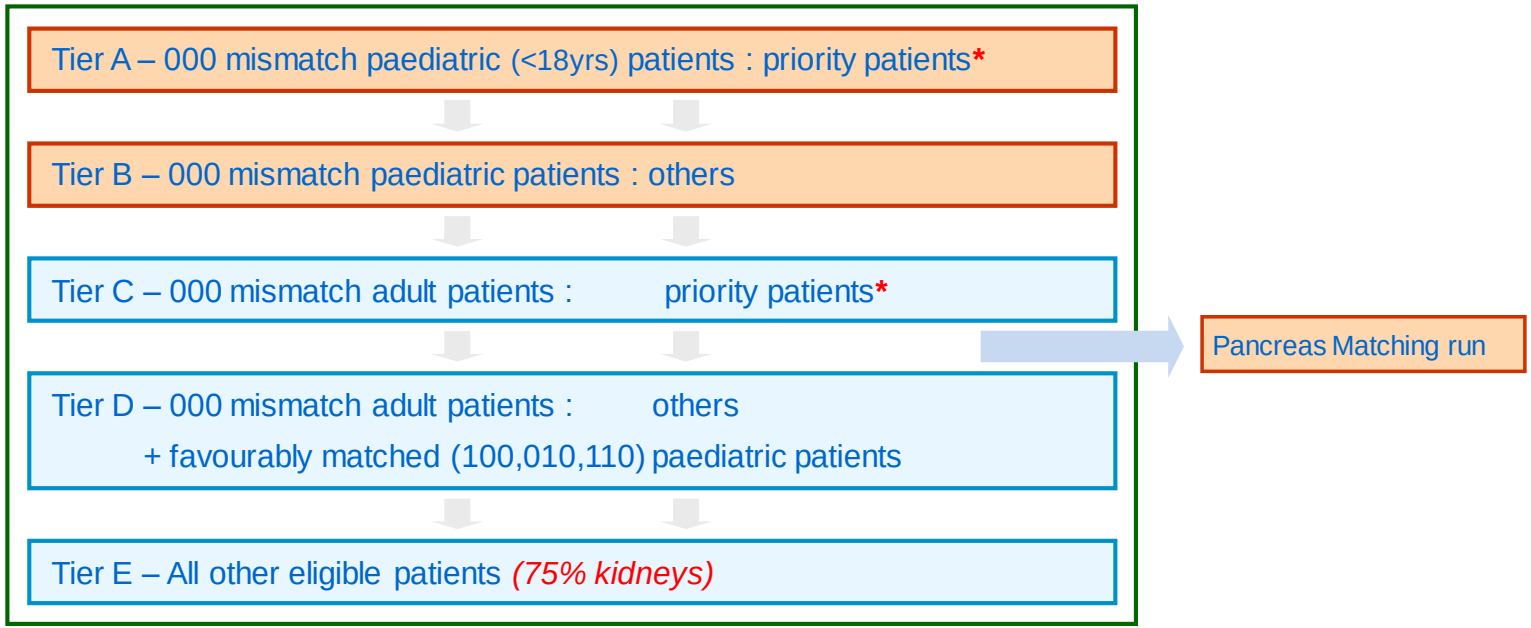
All donors after brain death kidneys allocated by national rules -



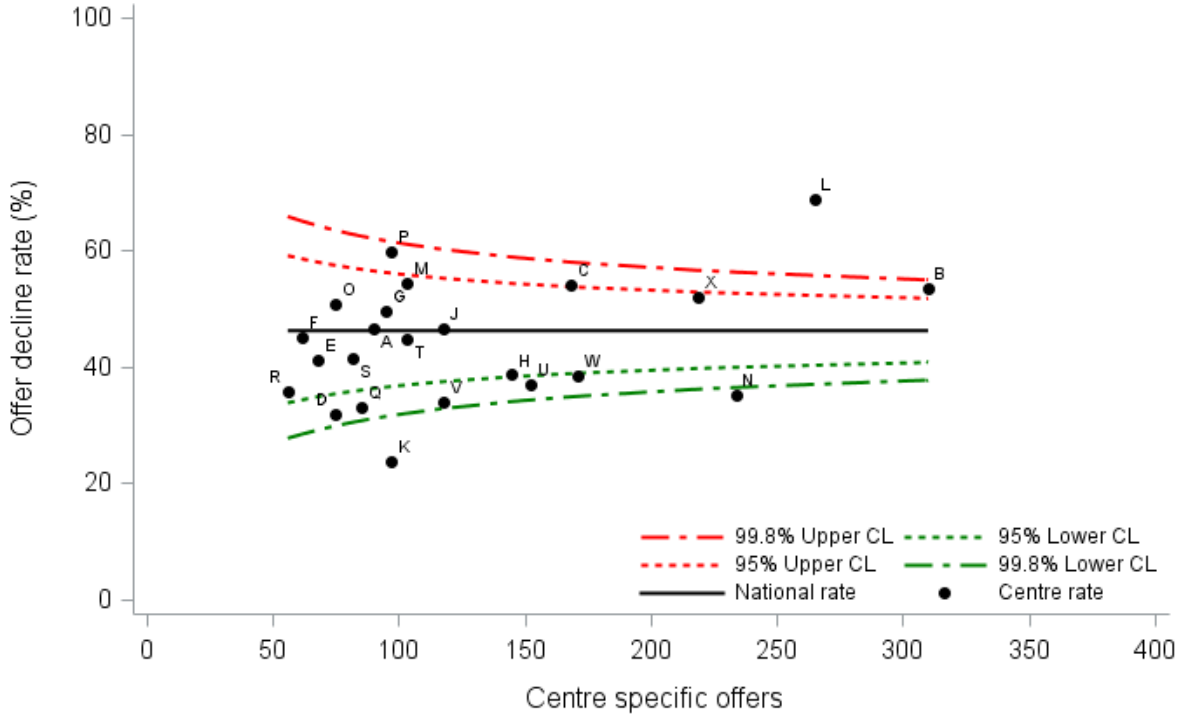
Defaulted antigens, Restricted blood group compatible matches,

No level 4 mismatches (2 B & 1 DR mm or 2 DR mm grafts)

High offer decline rates

Blood and Transplant

Figure 4.1 **Adult standard criteria DBD donor kidney offer decline rates for kidneys that resulted in a transplant, 1 April 2013 and 31 March 2016**



Offer decline rates vary from 24% at Leeds to 69% at Leicester

Source: Annual Report on Kidney Transplantation 2016/17, NHS Blood and Transplant

Long waiting times for difficult to match patients

NHS Blood and Transplant

Matchability score:

Number in last 10,000 donors

- blood group identical and HLA compatible (calculated Reaction Frequency)
- 000, 100, 010, 110, 200, 210, 001, 101, 201 mismatch (Level 1 or 2).
- All patients on the waiting list are then divided in to deciles.
- 1 = easy to match, 10 = difficult to match

Long waiting times for difficult to match patients

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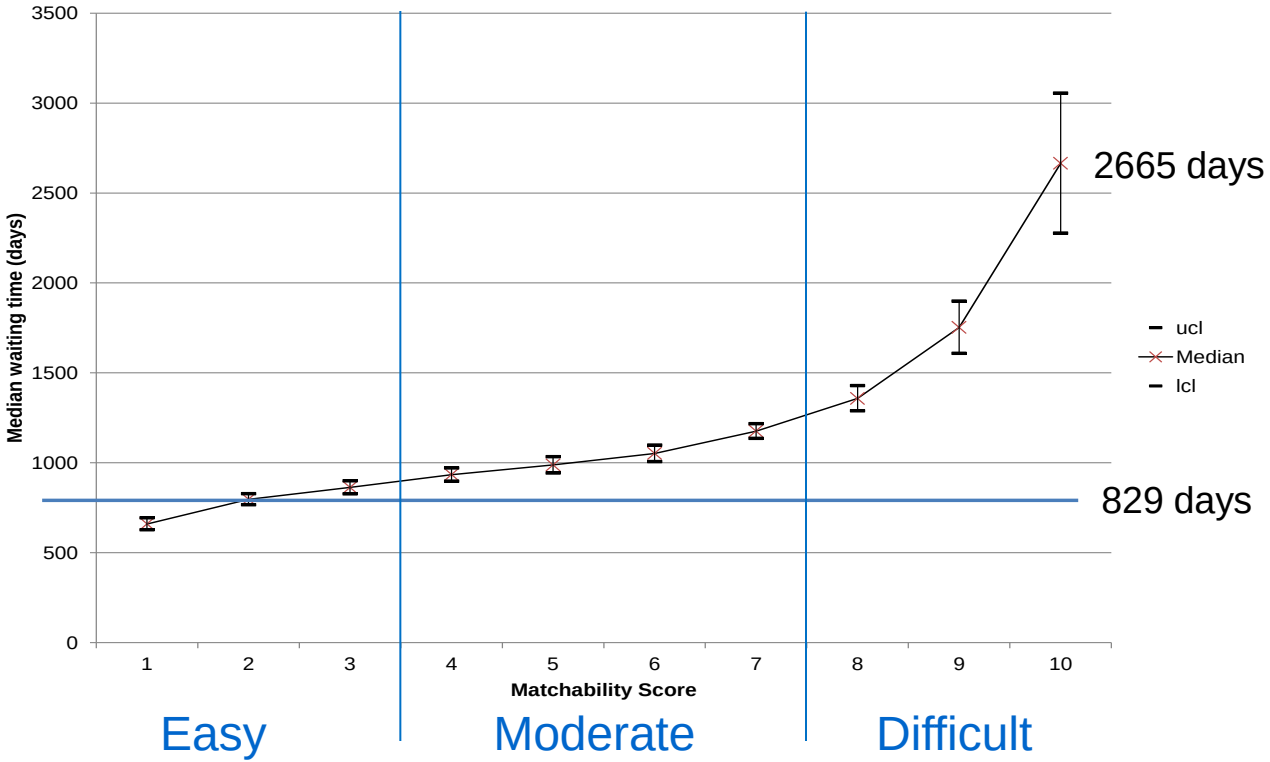

Design and Review of Kidney Offering Scheme

NHS Blood and Transplant

Lorna Marson (Chair)

Chris Callaghan

Peter Friend

Sue Fuggle

Paul Gibbs

Rachel Johnson

Stephen Marks

Phil Mason

Adam McLean

Lisa Mumford

Gabriel Oniscu

Nick Torpey

Chris Watson

Colin Wilson

Design and Review of Kidney Offering Scheme

NHS Blood and Transplant

Key Recommendations:

- Consider removing current Tier system so that 000 mismatched patients do not receive absolute priority
- Introduce the use of matchability score for long waiting and difficult to match patients
- Match graft life expectancy with patient life expectancy to decrease the incidence of offer declines

Philosophy of allocation

NHS Blood and Transplant

Rachel Hilton (Chair)	Heather Draper	Bernadette Li
Alison Brown	Chris Dudley	Rommel Ravanan
Tim Brown	Vicky Fox	Mandy Venters
Marc Clancy	Nick Inston	Chris Watson
Antonia Cronin	Mark Korad	Diana Wu

Philosophy of allocation

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Key Recommendations:

- Highly sensitised patients should receive prioritisation
- Age should be a continuous factor and not a cut-off at 18 years
- Waiting time should be calculated from the earliest of starting dialysis or activation on the waiting list

HLA Working group

NHS Blood and Transplant

Sue Fuggle (Co-Chair)

Dave Turner (Co-Chair)

Martin Barnardo

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David Briggs

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Tracey Rees

Linda Shelper

Craig Taylor

Nick Torpey

Bob Vaughan

Chris Watson

HLA Working group

NHS Blood and Transplant

Key Recommendations:

- The repertoire for donor HLA Typing should be extended *(including HLA-DPB1, DPA1 and DQA1)*
- Where HLA matching is deemed appropriate, all loci should be considered as part of the allocation *(A, B, Cw, DR, DQ)*
- Offers to long waiting patients and highly sensitised patients should be flagged with the Transplant Units
- There should be no automatic exclusion criteria based on HLA antigen matching for difficult to match sensitised patients

Key Objectives

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- Unify DBD and DCD offering with all DBD and DCD kidneys allocated through the 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

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Matching donor and recipient more effectively

Developing a donor and recipient risk index

NHS Blood and Transplant

Cohort

- 7,628 first deceased donor kidney only transplants in the UK
- Transplanted between 2006 – 2012
- Adult recipients
- Adult donors

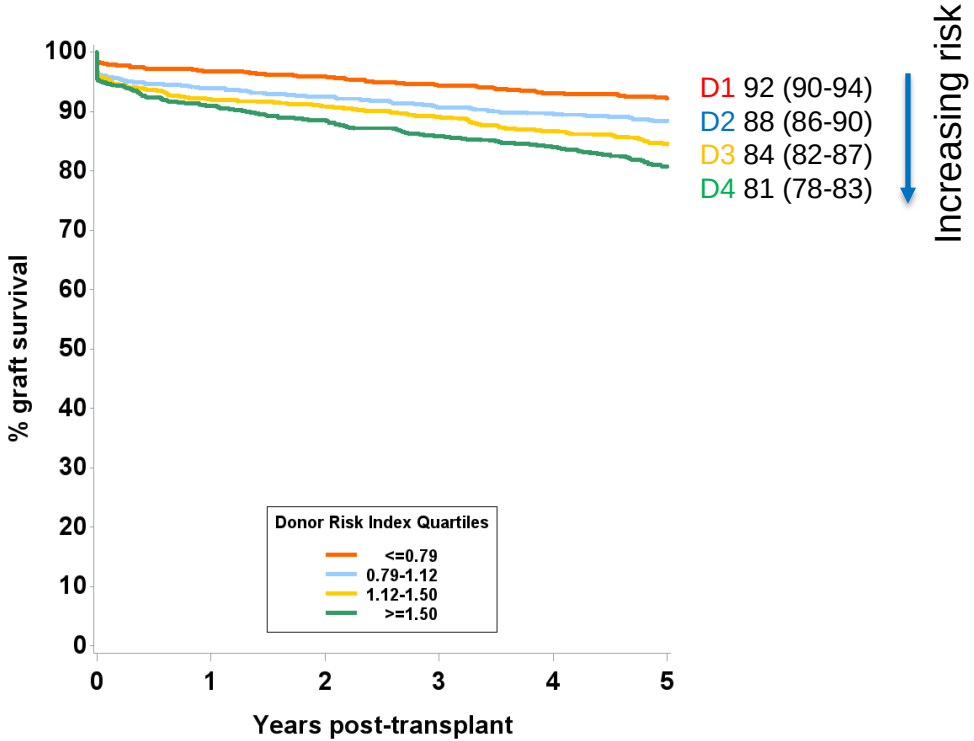
Donor Risk Index (DRI)

Validation dataset

NHS Blood and Transplant

Donor Factor	Hazard Ratio	p-value
Age	1.02	<0.0001
Height	0.86	0.0005
Hypertension	1.15	0.1
CMV	1.20	0.02
Hospital stay	1.02	0.006
eGFR	0.98	0.02
Female	0.83	0.04

C-statistic = 0.64



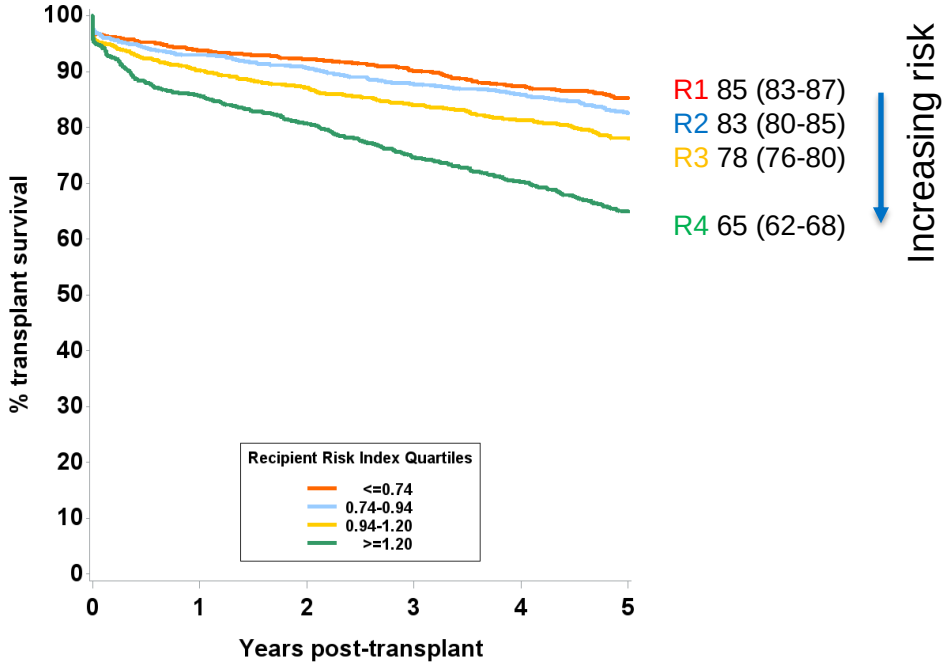
Recipient Risk Index (RRI)

Validation dataset

NHS Blood and Transplant

Recipient Factor	Hazard Ratio	p-value
Age (≤25)	1.00	0.9
Age (>25)	1.02	<0.001
Dialysis	1.43	<0.001
Diabetic	1.32	0.003
Time on dialysis (years)	1.03	0.004

C-statistic = 0.64



Offer decline rates by combination of DRI & RRI groups

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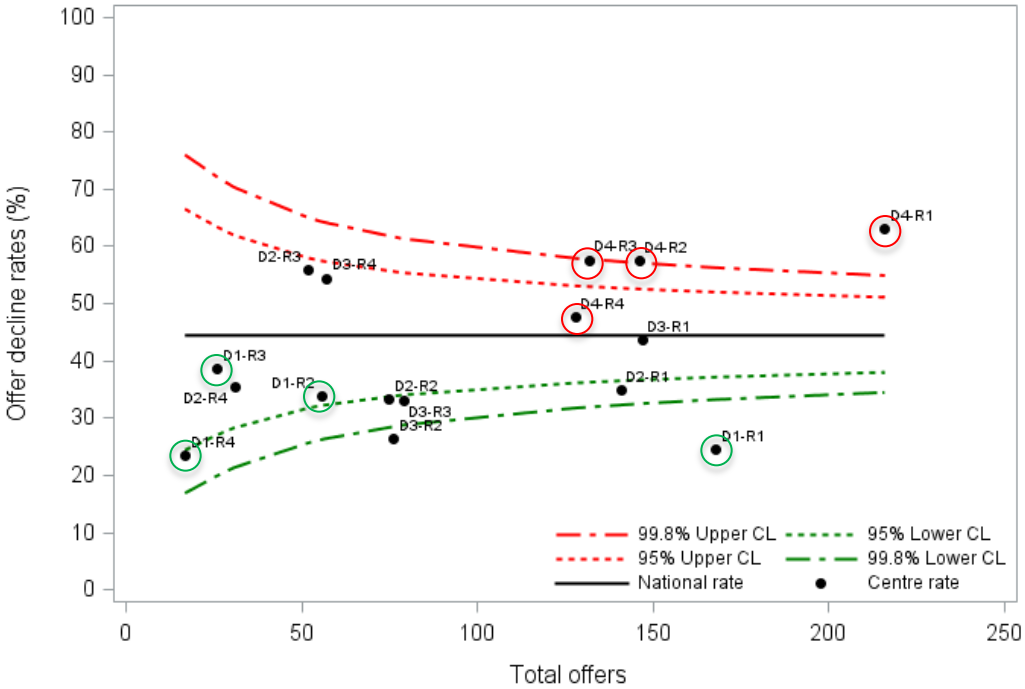
DBD donor kidney offers to named patients



D4 donors

D1 donors

5 year survival by combination of DRI and RRI group

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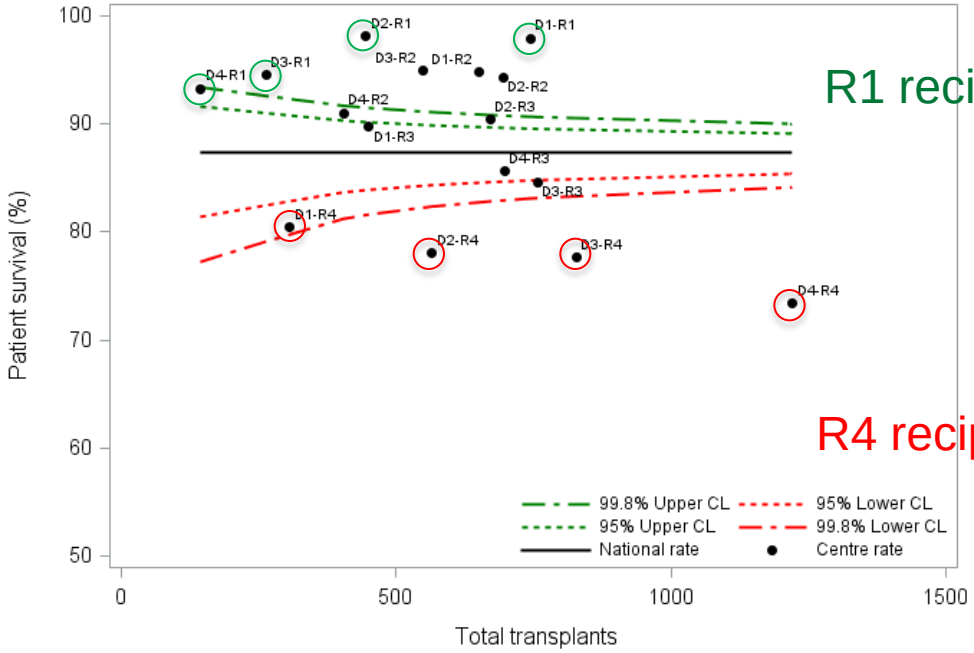
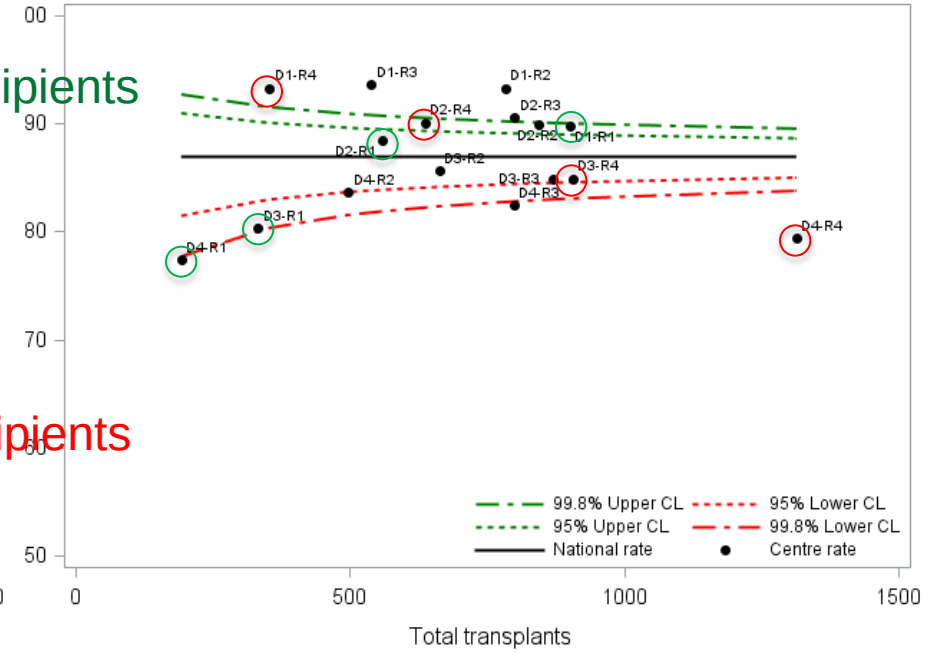
Patient survival



R1 recipients

R4 recipients

Graft survival



Graft vs Patient survival

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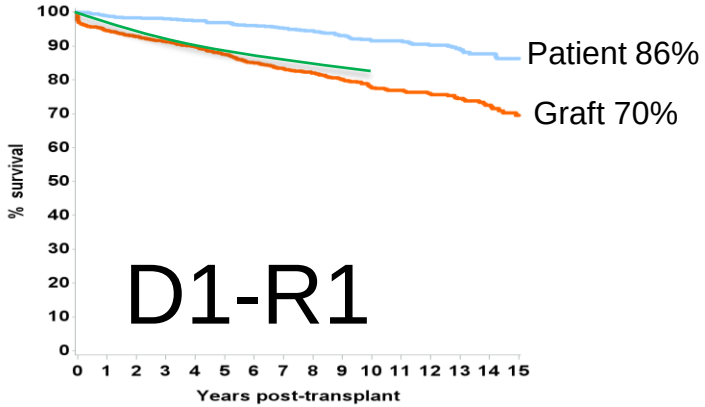

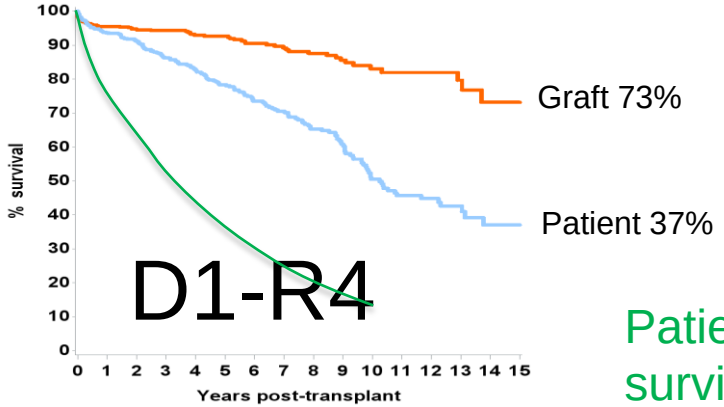

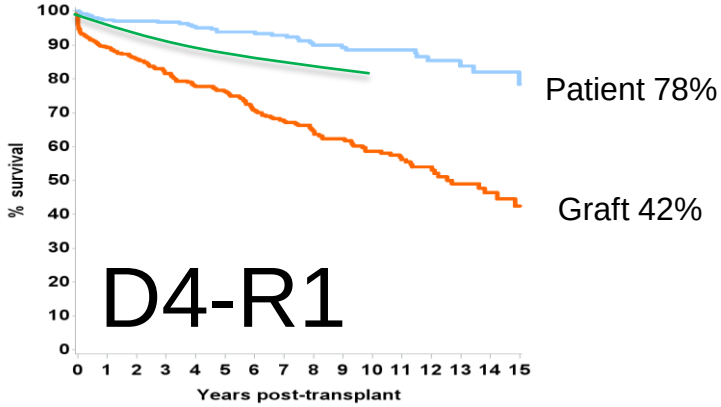

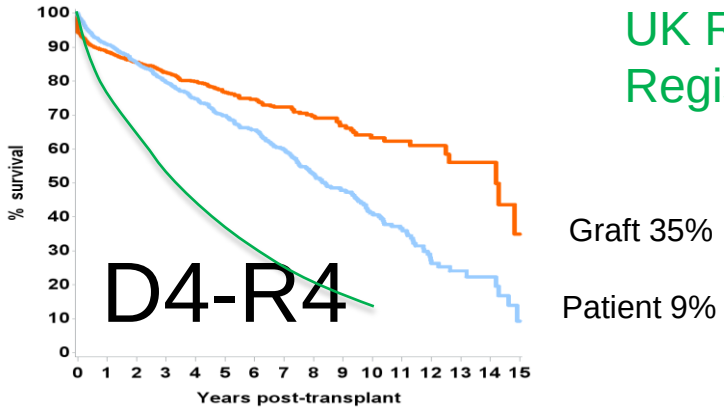

Patient survival from dialysis from UK Renal Registry

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Proposed kidney offering scheme

Simulating a new Kidney Offering Scheme

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- Computer simulations used to investigate different offering scheme algorithms.
- Using standard pools of real kidney donors and listed patients in each of the simulations.
- Each simulation represent four years of kidney transplant activity.
- Each simulation assumes activity will remain constant over the four year period.

Previous simulations

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Previous simulations have predicted quite well in the past

- 2006 kidney allocation scheme
- 2010 pancreas allocation scheme

Fig 1.1a Age by mismatch of simulated transplants in 2006 scheme

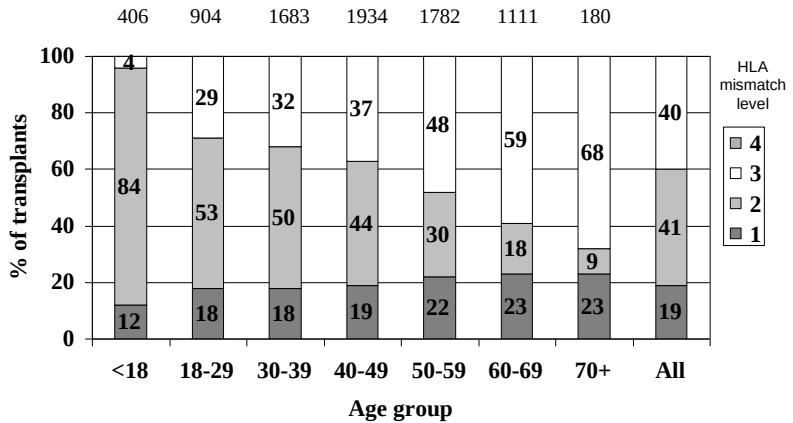
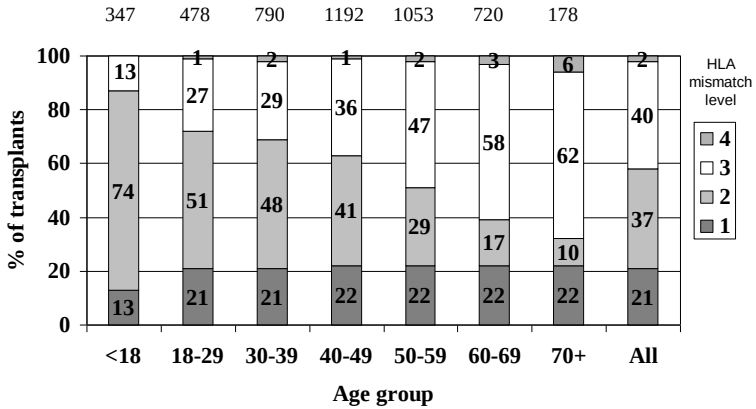


Fig 1.1b Age by mismatch of actual transplants in 2006 scheme, 3 April 2006 - 31 March 2014



Summary of basic principles

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All **deceased** donor kidneys are allocated through scheme:

Tier A Patients with matchability score = 10 or 100% cRF or ≥7 years

Allow blood group O to B, HLA level 4 transplants

Tier B All other patients

Allow HLA level 4 transplants for matchability score 8 and 9 only

Within Tier A; patients prioritised by waiting time from dialysis only
Within Tier B, patients prioritised by point score

Factors included in points score:

Donor and recipient risk index match (D1-D4, R1-R4),
Waiting time from earliest of start of dialysis or activation date on the list,
HLA match & age points combined, Location points, Matchability points,
Total mismatch points, Blood group points

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Simulation results

Comparing alternative schemes

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Different possible schemes simulated and results compared according to

- characteristics of simulated transplant pool
  - Patient age, blood group, ethnicity, waiting time etc
  - HLA mismatch levels
  - predicted survival rates

- characteristics of patients on list at end of simulation

Need to find best compromise between competing objectives

Results - Matchability and cRF

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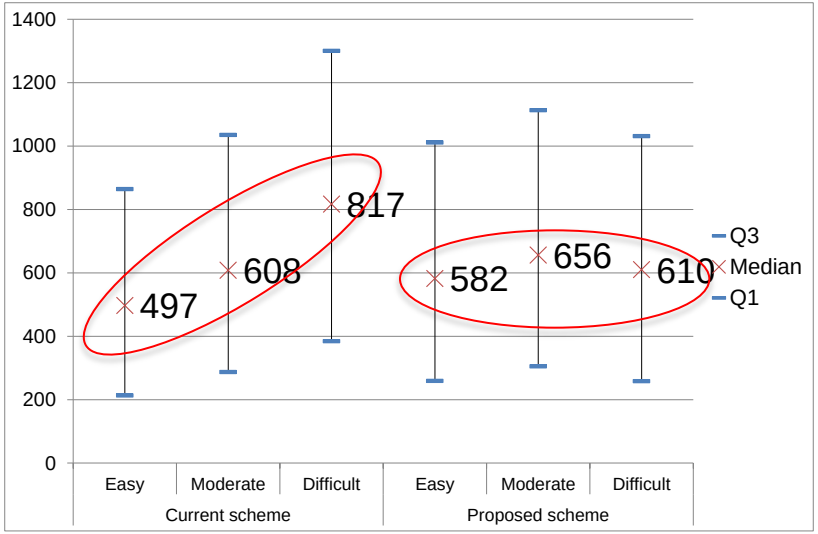
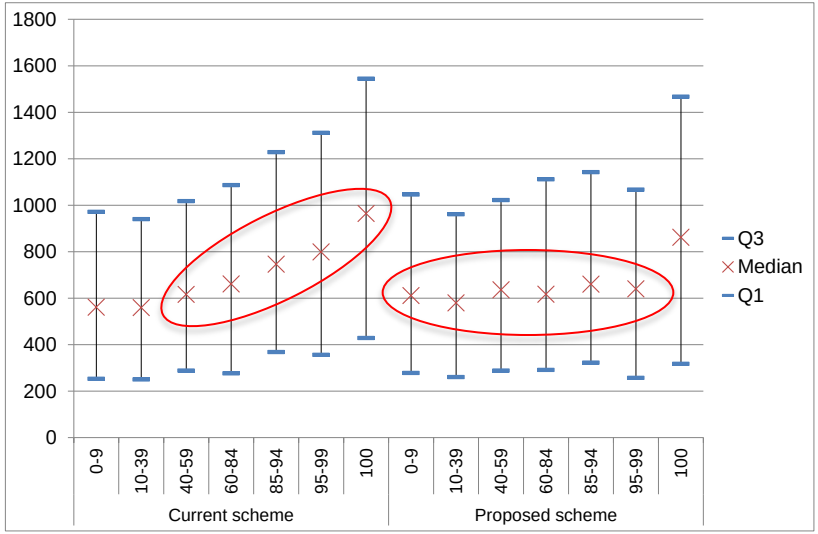
Waiting time on list end of year 4

Matchability



cRF



The proposed scheme

- Transplants more difficult to match and highly sensitised patients
- Reduces the variability in waiting time

Results - Ethnicity

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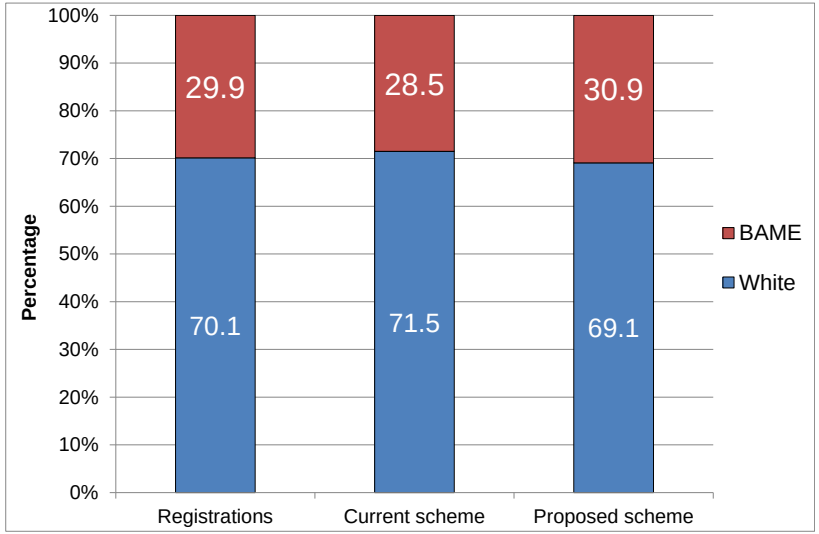
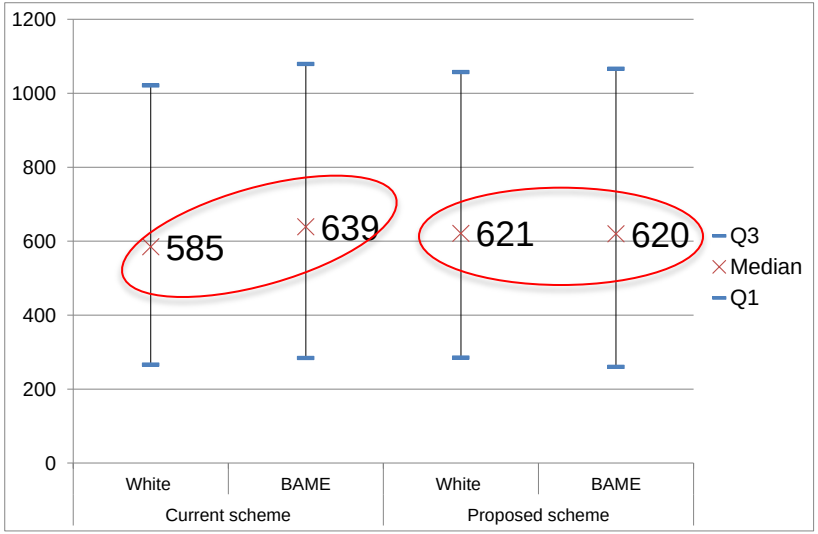
Transplants



Waiting time on list end of year 4



The proposed scheme

- Transplants more BAME patients in line with new registrations
- Reduces the variability of waiting time between white and BAME patients

Results - Recipient age

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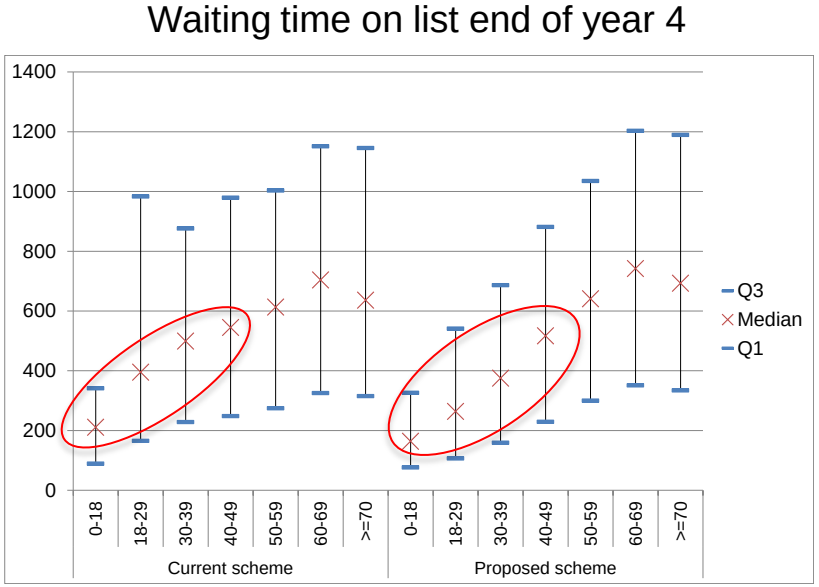

The proposed scheme

- Treats age as a continuous factor
- Keeps transplant rates, number of patients on the waiting list and waiting time to transplant similar to the current scheme
- Older patients still wait longer for a transplant

Results - HLA Group

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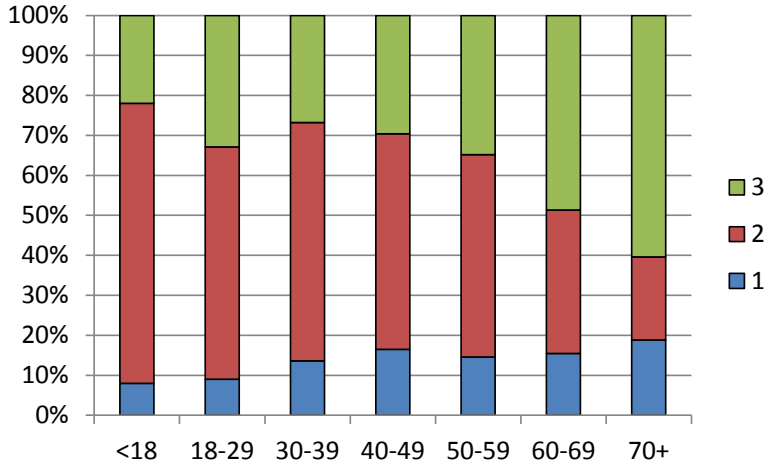
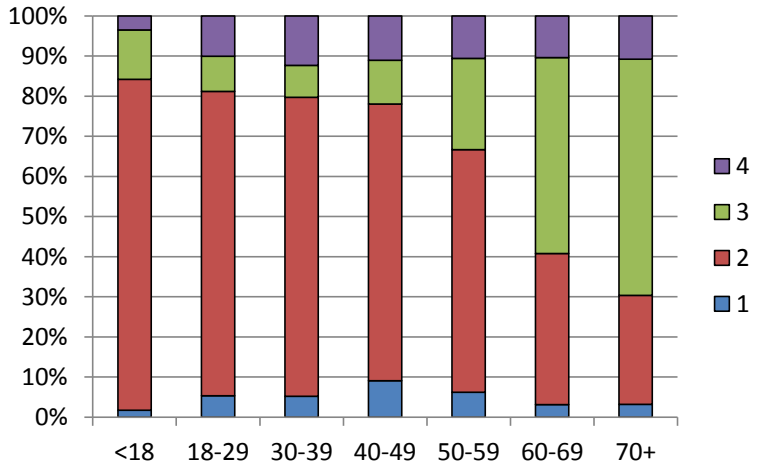
The proposed scheme

- allows HLA Level 4 transplants to select patients
- Reduces HLA matching for older patients
- Does not prioritise 000 mismatched transplants and as such reduces the overall number

Current scheme



Proposed scheme

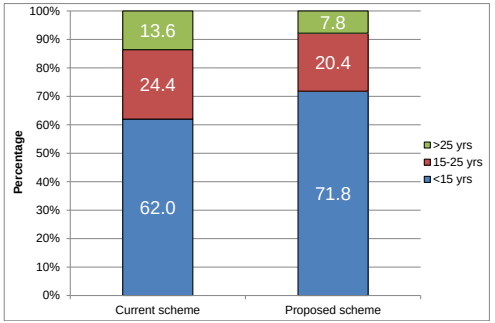


Results - Donor quality

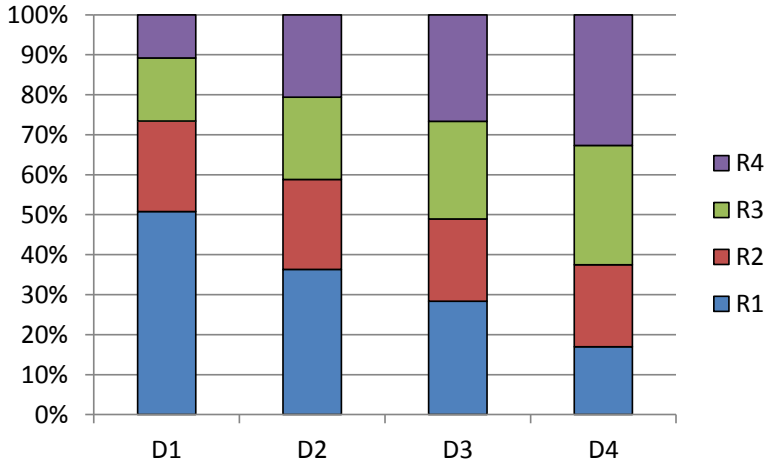
NHS Blood and Transplant

The proposed scheme

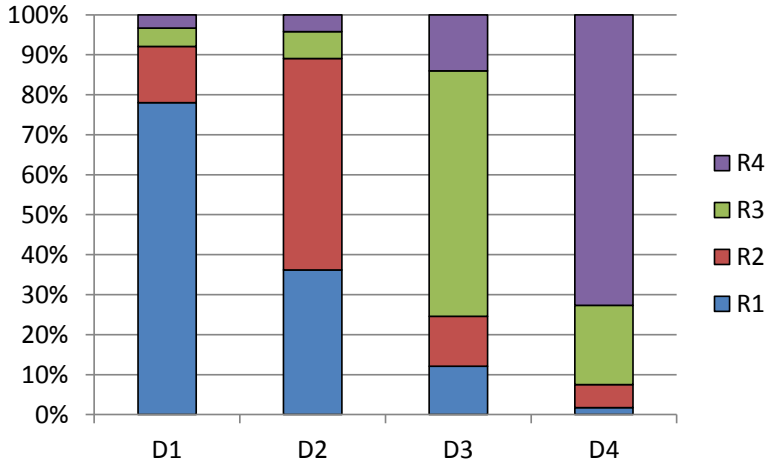
- Reduces the number of transplants with a greater than 25 year age difference
- Matches donor and recipient more effectively with few D4 kidneys being offered to R1 recipients



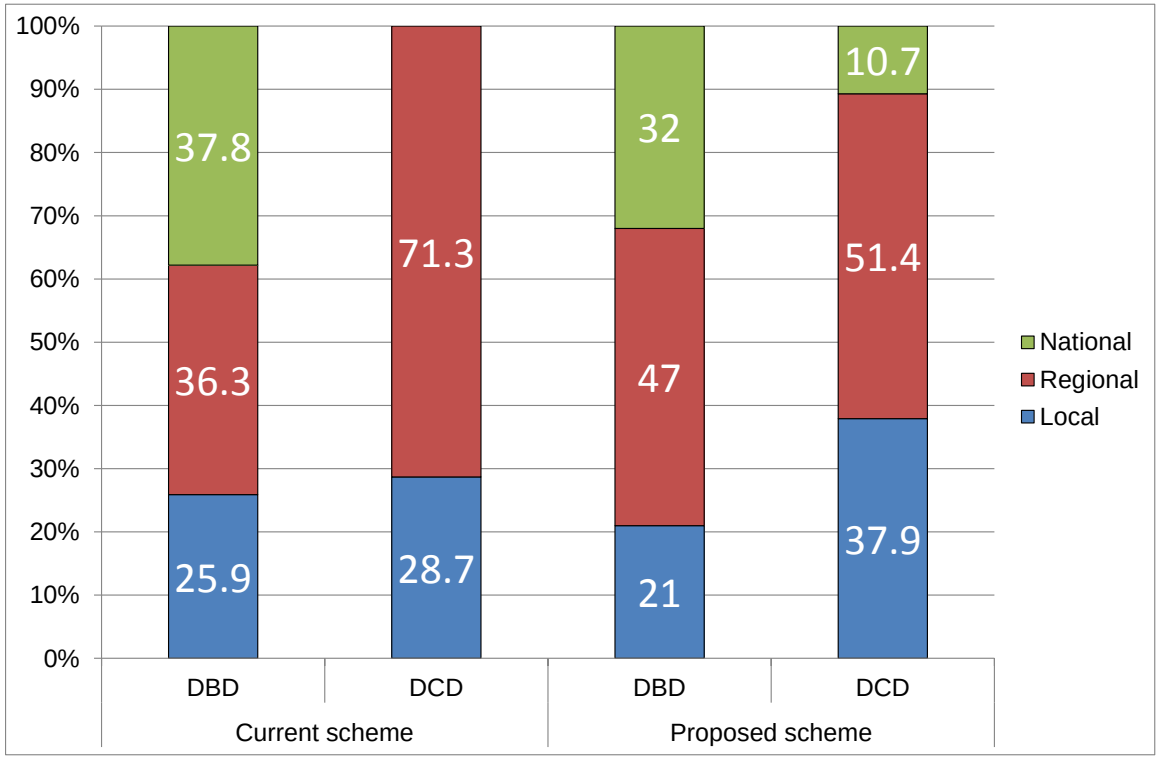
Current scheme



Proposed scheme



Results – Transplant location



The proposed scheme

- Allows few national transplants of DCD donor kidneys to patients that need it
- Reduces shipping where it is not needed

Predicted 5 year graft and patient survival

NHS Blood and Transplant

		Current scheme	Proposed scheme
5yr Patient survival		90.8%	90.8%
RRI Grp	1	95.8%	96.1%
	2	92.8%	93.1%
	3	88.4%	87.9%
	4	76.6%	74.7%
5yr Graft survival		86.2%	86.3%
RRI Grp	1	88.8%	89.7%
	2	87.0%	87.6%
	3	85.5%	84.6%
	4	83.3%	80.4%

Additional considerations

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- D4 kidneys from donors over the age of 70 to be offered for centre choice as either a dual or single kidney transplant
- SPK patients with matchability score = 10 to be considered in Tier A of proposed scheme.
- SPK patients with matchability score <10 to be considered after Tier A
- Fast Track scheme to remain in place with review after scheme introduced

Summary

NHS Blood and Transplant

- Working groups were formed to consider recommendations for a new kidney offering scheme
- Donor and Recipient risk indices were developed to match donor and recipients more effectively
- Simulations have been produced to identify the best solution for the next Kidney Offering Scheme in line with key recommendations
- Consultation period

Acknowledgements

Kidney Offering Scheme Working Group

Chris Watson (Chair)

Chris Dudley

Sue Fuggle

John Forsythe

Peter Friend

Rachel Hilton

Rachel Johnson

Lorna Marson

Phil Mason

Lisa Mumford

Keith Rigg

David Turner