1. PRINCIPLES OF KIDNEY TWL MATCHING IN ORGANMATCH

In OrganMatch, recipients listed on the kidney transplant waiting list (TWL) are matched with deceased organ donors using multi-tiered matching algorithms.

There are three parent algorithms, which run separately, in OrganMatch:

- Standard v2
- Interstate Utilisation v2
- ABOi (ABO incompatible) v2

Matching using the above parent algorithms triggers a series of functions.

The new version of the Kidney Matching Algorithm (KAv2) is effective from May 4, 2021.

1.1 HIGH-LEVEL COMPATIBILITY CHECK

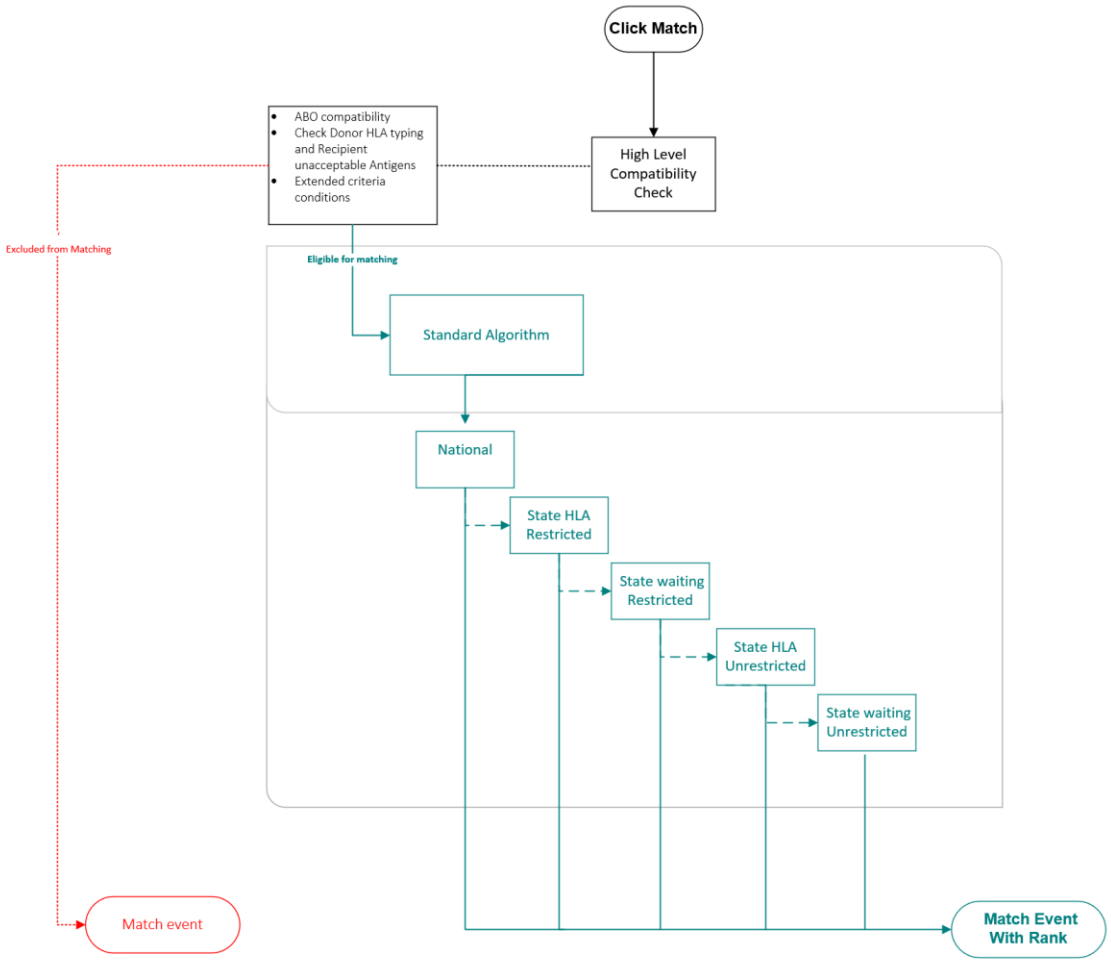
The first step in matching is the high-level compatibility check, which determines if recipients will progress to being matched in the next stage of the algorithm.

Check	Process	!	✖	✓
HLA mismatches are identified	Compares *only* loci A, B, and DRB1. Compares at 1 field and 2 fields using the exception table.	HLA mismatches are listed	N/A	No HLA Mismatches
No Unacceptable Antigens (UA) identified	Compares donor HLA with recipient UA. Includes all HLA loci.	Potential UA for the donor are listed Will proceed to matching.	UA and donor HLA match. Does not proceed to matching.	Recipient and donor compatible. Proceeds to matching.
Extended criteria checked	Donor extended criteria is checked first and Recipient Extended Acceptance Criteria are compared. If there is no extended criteria for the donor, proceed to matching.	N/A	Does not proceed to matching.	Proceeds to matching.
Valid ABO for program	Checks ABO compatibility.	N/A	Does not proceed to matching.	Recipient and donor compatible. Proceeds to matching.

If a recipient passes the high-level compatibility check, they progress to matching, depending on which parent algorithm is selected.

2. STANDARD ALGORITHM (KAV2)

The Standard kidney algorithm consists of a number of child algorithms. The child algorithms are executed in a set order and are dependent on the OrganMatch Lab from where the deceased organ donor is matched.



2.1 NATIONAL ALGORITHM

TABLE 1: CRITERIA FOR NATIONAL ALGORITHM LEVELS

Match Level	Description	Criteria	Base Score
1	Very Highly sensitised ABO Compatible	**1a** mPRA>=99.7 **1b** mPRA>=99 **1c** mPRA>=98 **1d** mPRA>=97 **1e** mPRA>=96 **1f** mPRA>=95	99 700 000 99 000 000 98 000 000 97 000 000 96 000 000 95 000 000
National Urgent	ABO Compatible	Recipient National urgency >0	90 000 000
2	EPTS restriction HLA matching Prioritises Low EPTS recipients Matched at HLA DRB1 ABO Matched KDPI max value is applied from this level down	**2a** 0 mismatches HLA-A or HLA-B and EPTS <=25 **2b** 1 mismatch HLA-A or HLA-B and EPTS<=25 **2c** 2 mismatch HLA -A or HLA-B and EPTS<=25 **2d** 0 mismatches HLA -A or HLA-B and EPTS <=60	89 000 000 88 000 000 87 000 000 86 000 000

Match Level	Description	Criteria	Base Score
3	a/b/c HLA matching Highly Sensitised	**3a** 0 mismatch at HLA A or HLA B or HLA DRB1 And mPRA > 80	79 000 000
	d/e/f/g HLA Matching Centre credit difference	**3b** 1 mismatch at HLA A or HLA B or HLA DRB1 And mPRA > 80	78 000 000
		3c 2 mismatches at HLA A or HLA B or HLA DRB1 And mPRA > 80	77 000 000
		3d Matched at HLA DRB1 1 mismatch HLA A or HLA B And mPRA<= 80 And Centre credit difference <=-3 And EPTS-KDPI<50	76 000 000
		3e Matched at HLA DRB1 2 mismatches HLA A or HLA B And mPRA<= 80 And Centre credit difference <=-6 And EPTS-KDPI<50	75 000 000
		3f mPRA > 80 Centre credit difference <=-9 And EPTS-KDPI<50	74 000 000
		3g Centre credit difference <-20 EPTS-KDPI<50	73 000 000

See **Definitions** for more information on centre credit difference.

2.2 CALCULATION OF KIDNEY NATIONAL ALGORITHM SCORE

The National Score is calculated by assigning a base score – depending on the number of HLA mismatches, Match cPRA (mPRA), the patient's National Urgency Index and the centre credit difference between the donor and recipient centres (see **TABLE 1: CRITERIA FOR NATIONAL ALGORITHM LEVELS**) – and then add the following bonus points:

Other Parameters	Bonus Points Added
Paediatric (17 and under)	250 000
Paediatric Bonus	218750 (18yrs), 187500 (19yrs), 156250 (20yrs), 125000 (21yrs), 93750 (22yrs), 62500 (23yrs), 31250 (24yrs)
Donor centre = patient centre	50
Recipient Centre credit	1000 + recipient centre credit
Recipient and Donor are HLA DRB1 homozygote	500 000 (except level 3G)
Waiting time (on dialysis)	Number of months x 1

EPTS-KDPI restriction occurs when EPTS-KDPI < 50 for Level 3d to 3g. The intent of this parameter is to avoid high quality kidneys being shipped interstate for reasons of state balancing only.

The lowest threshold is 73,000,000. Recipients with a score less than 73,000,000 then progress to the **state algorithms**.

See **Definitions** for more information on lab credit.

3. STATE ALGORITHMS

3.1 CALCULATION OF STATE HLA ALGORITHM SCORES

The base score is calculated for each recipient if:

- their ABO type is compatible with donor as determined by the ABO Type Selection Rules
- they are from the same state centre as the donor.

3.2 STATE KIDNEY ALGORITHM

EPTS-KDPI restriction occurs when EPTS-KDPI < =50. The intent of this parameter is to enable low KDPI donor kidney to be prioritised to low EPTS recipients.

If the all patients on the transplant waiting list are categorised in the “restricted” group ie: EPTS-KDPI < 50, only the restricted algorithm will appear in the TWL match.

An example would be a high KDPI donor eg; KDPI = 80, and as the max EPTS is 100, all recipients would fall into the “restricted category” as EPTS-KDPI <=50 applies. There would be no patients outside of this category.

For a lower KDPI donor eg; KDPI = 20, only the patients with EPTS < 70 will fall into the restricted group to meet the restricted criteria. So this group of patients will be prioritised. The remaining patients with EPTS >70 will be in unrestricted category and they will appear under (lower rank) the restricted patients in the TWL matching.

Therefore, you would only expect both the restricted and unrestricted lists to appear with the lower KDPI donors, as the restricted list will appear above the unrestricted list.

Note: Paediatric donors have their Match KDPI capped at a maximum value of 20. This has been implemented to help prevent the allocation of kidneys from paediatric donors to significantly older recipients via the State Restricted Matching algorithm. Refer to *OM-042 Deceased Donor Enrolments- Laboratory Portal* for more information on KDPI.

Flexibility for state to nominate at which level to move from state HLA to State waiting. The current state thresholds are:

- NSW 1E
- QLD 1E
- VIC 1E
- WA 1E
- SA 1E

ABO rules are aligned for NSW, VIC, SA, WA, QLD.

KDPI max functionality also applies as determined by local clinical units.

The state matching algorithm sequentially flows as follows:

- State HLA restricted.
- State waiting restricted.
- State HLA unrestricted.
- State waiting unrestricted.

TABLE 2: CRITERIA FOR STATE ALGORITHM LEVELS

Level	Description	Details	Base Score
State Urgent	State Urgency Index >0	Urgency index added to base score	60 000 000

Level	Description	Details	Restricted Base Score	Unrestricted Base Score
State HLA	HLA mismatches A/B/DRB1	**1a** 0 0 0	49 000 000	39 000 000
		1b 1 0 0 or 0 1 0	48 000 000	38 000 000
		1c 1 1 0	47 000 000	37 000 000
		1d 0 0 1	46 000 000	36 000 000
		1e 2 0 0 or 0 2 0	45 000 000	35 000 000
		1f 1 0 1 or 0 1 1	44 000 000	34 000 000
		1g 2 1 0 or 1 2 0	43 000 000	33 000 000
State Waiting	Months on dialysis	Number of months x 1	40 000 000	30 000 000

Additional scores:

- Paediatric bonus of 10 000 000 or 100 000 for restricted algorithms – state HLA and state waiting respectively. See table below for score for tapered paediatric bonus applied between 18 to 25 years of age.
- Recipient and donor are HLA DRB1 homozygous bonus 500 000 to state HLA matching algorithms only.

In the event that more than one patient has the same score, the ranking is randomised.

Age	State HLA Score	State Waiting Score
18	8 750 000	87 500
19	7 500 000	75 000
20	6 250000	62 500
21	5 000 000	50 000
22	3 750 000	37 500
23	2 500 000	25 000
24	1 250 000	12 500

4. INTERSTATE UTILISATION ALGORITHM

- The Interstate Utilisation Algorithm is an additional algorithm, which is invoked by the OrganMatch user if the standard algorithm did not list enough patients to enable transplantation.
- The score is calculated by assigning a base score and bonus points, by applying the criteria described in Table 3: INTERSTATE UTILISATION ALGORITHM.
- Interstate utilisation considers all states other than the donor state, base scoring as described in Table 3: INTERSTATE UTILISATION ALGORITHM.
- In the event that a patient from an OM lab which is different to the donor OM lab is matched via the national algorithm, there will be a duplication of this patient on the Interstate utilisation list.
- The Organ Exchange table will not be update for any recipients transplanted via this algorithm who are ranked 20 or numerically higher. Therefore, the credit centre difference will remain the same in this scenario.

TABLE 3: INTERSTATE UTILISATION ALGORITHM

Level	Description	Details	Restricted Base Score	Unrestricted Base Score
State HLA	HLA mismatches A/B/DRB1	**1a** 0 0 0	19 000 000	9 000 000
		1b 1 0 0 or 0 1 0	18 000 000	8 000 000
		1c 1 1 0	17 000 000	7 000 000
		1d 0 0 1	16 000 000	6 000 000
		1e 2 0 0 or 0 2 0	15 000 000	5 000 000
		1f 1 0 1 or 0 1 1	14 000 000	4 000 000
		1g 2 1 0 or 1 2 0	13 000 000	3 000 000
State Waiting	Months on dialysis	Number of months x 1	10 000 000	0

5. OTHER MATCHING ALGORITHMS

5.1 ABOi

- ABOi matching algorithm can only be used to match blood group AB donors with blood group A and B recipients that are registered on the TWL kidney program, and willing to accept an ABOi donor.
- The score is calculated in the same manner as the state algorithm; by assigning a base score and bonus points using the criteria described in Table 2: CRITERIA FOR STATE ALGORITHM LEVELS.

5.2 INCREASED VIRAL RISK DONORS (IVRD)

Donors that are registered as IVRD in OrganMatch will be matched using the standard algorithm, but with patients only registered as willing to accept IVRD donors.

5.3 HEPATITIS C (HEP C)

Donors that are registered as Hep C in OrganMatch will be matched using the standard algorithm, but with patients only registered as willing to accept Hep C donor.

6. ABO SELECTION RULES

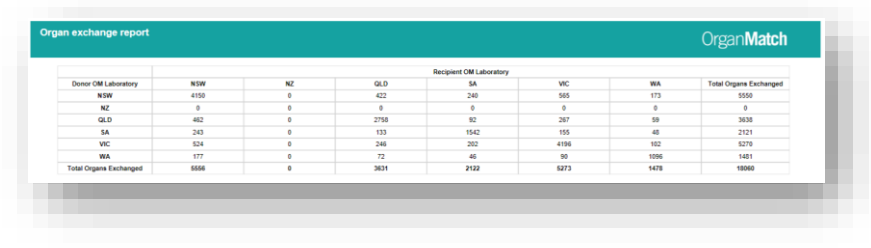
The ABO selection rules determine the acceptable organ matches, as shown:

Algorithm	Level	Donor ABO Type	Patient ABO Type
National	Level 1	A	A
		A	AB
		B	B
		B	AB
		AB	AB
		O	O
		O	A
		O	B
		O	AB
National	Level 2 and Level 3	A	A
		B	B
		AB	AB
		O	O
State	NSW WA VIC SA QLD	A	A
		A	AB
		B	B
		B	AB
		AB	AB
		O	O

7. USE OF KDPI MIN MAX

Currently the default setting for all recipients in OrganMatch – Kidney TWL program, is set at the min-max of 1 -100. The max value can be set by the clinical unit, which will restrict the recipient being matched at the national level (level 2 and Level 3) and also the state level.

DEFINITIONS

Term/abbreviation	Definition
ABOi	ABO incompatible
Centre	OrganMatch Lab
Centre Credit Difference	Donor state lab credit –recipient OM lab centre credit E.g.: If NSW donor and QLD recipient the centre credit difference = -6 - 7 = -13
EPTS	Estimated Post transplant survival
HEP C	Hepatitis C
HLA	Human Leucocyte Antigen
IVRD	Increased viral risk donor
KAv2	Kidney Matching Algorithms version 2
KDPI	Kidney Donor Prognosis Index
mPRA	Match calculated panel-reactive antibody.
OM	OrganMatch
OM Lab Credit	OM Lab credit = total number of kidneys donated – total number of kidneys received This information can be found in OrganMatch by generating the organ exchange report. E.g.: NSW lab credit = 5550- 5556 = -6 QLD lab credit = 3638- 3631 = 7 
TWL	Transplant waiting list

REFERENCED INTERNAL DOCUMENTS

Document number	Source
OM-042	Deceased Donor Enrolments- Laboratory Portal

CHANGE HISTORY

Version number	Effective date	Summary of change
-	-	For previous change histories contact the National OrganMatch Office.
4	28/05/2024	Sprint 52 updates: • Modification of QLD State Waiting to remove blood group O donors to B recipients. • Addition KDPI maximum cutoff for paediatric donors for state algorithms. • Added new document to Referenced Internal Documents. Other: • Update to new template. • Update flow diagram.
5	23/07/2024	Sprint 53 updates: • Addition of EPTS-KDPI restriction for level 3d to 3g in the National Algorithm. • Modification of the centre credit balance rule to not update for rank 20 and higher on the interstate utilisation algorithm. Other: • Correction of the title.
6	Refer to footer	Sprint 58 updates: • Section 2 updated to include national paediatric tapering bonus for 18 to 24 year olds. • Section 3 updated to include state HLA and waiting paediatric tapering bonus for 18 to 24 year olds.

ELECTRONIC SIGNATURE

Author	REBECCA SCAMMELL
Approver(s)	NARELLE WATSON