

諸外国における腎移植の配分について

US OPTN Kidney Tx allocation new scheme

2014年12月に改訂された献腎の斡旋はレシピエントがどれぐらい長く献腎を生着できるかという指標である Estimated Post Transplant Survival Score (EPTS)と献腎の質の指標である Kidney Donor Profile Index から決定される。

EPTS は KDPI が 0-20%の時のみ用いられる。

EPTS が 20%以下の長期生着を望める患者には KDPI が 20%以下の質の高い献腎が優先的に提供される。

EPTS は 18 歳未満の小児では用いられず、小児には KDPI が 35%未満の質の高い献腎しか提供されない。

Candidates with a lower EPTS score are expected to experience more years of graft function from high-longevity kidneys compared to candidates with higher EPTS scores:

- Candidates with lower EPTS scores tend to be of a younger age.
- Analysis has revealed that candidates in their mid-50s can still have EPTS scores in the Top 20%.
- Though candidates with diabetes tend to have higher EPTS scores, the same analysis showed that some younger diabetics have EPTS scores of 20% or less.
- Candidates who have had a prior solid organ transplant, as well as those having spent many years on dialysis, tend to have higher EPTS scores.

EPTS が低値（長く生着すると期待される患者）は若く、糖尿病がなく、透析歴の短い患者である。

KDPI が 20%以下の質の高い献腎はまず PRA が高い抗体を多く持っている患者へ、特に EPTS が 20%以下の長く生着が期待できる患者を対象として HLA ABDR が 0 mismatch の患者へ提供される。また以前生体腎移植のドナーで腎機能を喪失した患者、小児が対象となる。

Table 8-1: Kidney Points

If the candidate is:	And the following allocation sequence is used:	Then the candidate receives this many points:
Registered for transplant and meets the qualifying criteria described in <i>Policy 8.4: Waiting Time</i>	8.5.H, 8.5.I, 8.5.J, or 8.5.K	1/365 points for each day since the qualifying criteria in <i>Policy 8.4: Waiting Time</i>
Aged 0-10 at time of match and a 0-ABDR mismatch with the donor	8.5.H, 8.5.I, or 8.5.J	4 points
Aged 11-17 at time of match and a 0-ABDR mismatch with the donor	8.5.H, 8.5.I, or 8.5.J	3 points
Aged 0-10 at time of match and donor has a KDPI score <35%	8.5.H, 8.5.I	1 point
A prior living donor	8.5.H, 8.5.I, or 8.5.J	4 points
Sensitized (CPRA at least 20%)	8.5.H, 8.5.I, or 8.5.J	See <i>Table 8-2: Points for CPRA</i>
A single HLA-DR mismatch with the donor*	8.5.H, 8.5.I, or 8.5.J	1 point
A zero HLA-DR mismatch with the donor*	8.5.H, 8.5.I, or 8.5.J	2 points

*Donors with only one antigen identified at an HLA locus (A, B, and DR) are presumed "homozygous" at that locus.

US の献腎の斡旋のシステムは複雑ではあるが、結果的には質の高い腎臓は HLA 0 mismatch、PRA の高い患者、小児の患者に斡旋される傾向がある。

UK Transplant (英国での献腎移植のallocation)

1.2 Allocation scheme principles

1.2.1 Patient prioritisation

All kidneys from deceased donors are allocated via an evidence-based computer algorithm. This is based on five ranked Tiers of recipients who are eligible (as defined below) to receive a particular donor's organs:

Tier	Patients
A	• 000 mismatched paediatric patients - highly sensitised* or HLA-DR homozygous
B	• 000 mismatched paediatric patients – others (all except those in Tier A)
C	• 000 mismatched adult patients - highly sensitised* or HLA-DR homozygous
D	• 000 mismatched adult patients – others (all except those in Tier C) • Favourably matched paediatric patients (100, 010, 110 mismatches)
E	• All other eligible patients

* ≥85% calculated reaction frequency (based on comparison with pool of 10,000 donor HLA types on national database)

For donors after circulatory death, if the HLA type is not known at the time of offering, all patients will be prioritised within one tier according to prioritisation criteria for Tiers C, D and E.

Paediatric patients are prioritised within Tiers A and B according to waiting time.

Within Tiers C, D and E, patients are prioritised according to a points-based system (highest score first), based on 7 elements, these include:

- Waiting time
- HLA match and age combined
- Donor-recipient age difference
- Location of patient relative to donor
- HLA-DR homozygosity
- HLA-B homozygosity
- Blood group match

英国では、HLA 000 mismatchの小児の待機患者が優先され、その中でも抗体をたくさん持つ患者またはHLA-DRの2つの番号が同じ(homozygous)患者が選ばれるようになっている。待機期間に関しては小児の患者のTier A, Bの中で順位付けをするようになっており、待機期間、を無視してまずHLA 000 mismatchと小児が優先される仕組みである。

Their C,Dの成人では点数の合算された点数により 優先される。

Waiting times

Number of days of waiting time accrued.

Waiting time is determined from date of first active listing for a graft. Each day on the list accrues 1 point, including all days of suspension from the list.

For the majority of patients, waiting time starts at 0 on the day they are established as 'active' on the kidney transplant list. However, 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.

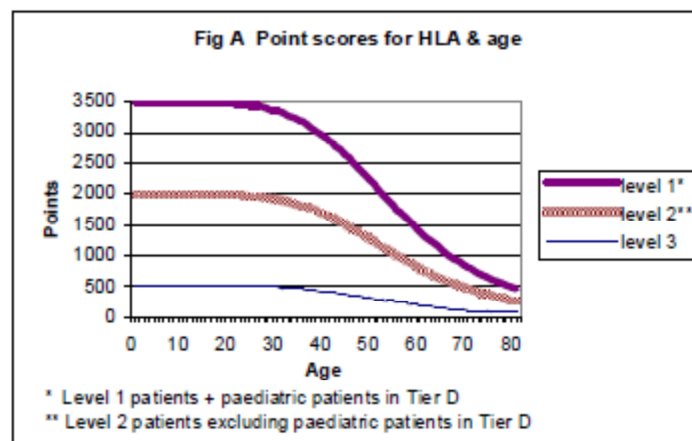
Waiting time is transferable when a patient transfers from one transplant centre to another. The time will be calculated automatically provided the patient has not been 'removed' from the list as part of the transfer. When a patient is notified as 'removed' from the list their waiting time is lost.

HLA match and age combined

Points are defined as

- $3500 \text{ points} / (1 + (\text{age}/55)^5)$ for level 1 mismatch patients and paediatric patients in Tier D
- $2000 \text{ points} / (1 + (\text{age}/55)^5)$ for level 2 mismatch patients excluding paediatric patients in Tier D
- $500 \text{ points} / (1 + (\text{age}/55)^5)$ for level 3 mismatch patients

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



Donor-recipient age difference

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

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.

待機期間は1日1点、10年では3652点になる。

HLA適合度と年齢は両方を兼ね合わせて、点数が出る仕組みで、HLA 1mismatchと小児（移行期間があるため30歳まで）では3500点、約10年の待機期間に当たる点数が付与されている。55歳の成人はHLA 1mismatchで1750点、2mismatchで1000点が加算される。

またドナーとレシピエントの年齢差によって合計点数から差し引かれる。

60歳のドナーでレシピエントが20歳であれば、合計から800点が差し引かれる。つまりドナーとレシピエントがなるべく年齢を合わせる仕組みになっている。

Euro Transplant の allocation

4.2.2.1.4 Point assignment

The number of mismatches on the loci HLA-A, HLA-B and HLA-DR is added according to the following formula:

$$= 400 \times [1 - (\Sigma \text{ broad HLA-A, -B, split HLA-DR mismatches} / 6)]$$

Number of HLA-A, -B, -DR mismatches	Number of points
0	400.00
1	333.33
2	266.67
3	200.00
4	133.33
5	66.67
6	0.00

4.2.2.1.5 HLA-bonus for paediatric recipients

For pediatric transplant candidates (see § 4.2.2.4), the points for HLA-antigen mismatch are doubled.

HLA 適合度で 0 mismatch は 400 点、1 mismatch は 333 点
小児の場合は 0 mismatch は 800 点、1 mismatch は 667 点

日本の場合は 0 mismatch は 14 点、A または B 1 mismatch は 13 点、DR 1 mismatch は 9 点。

小児の場合は、16 歳未満が 16 点、16 歳以上 20 歳未満が 14 点加算される。

4.2.2.3 Waiting time

The points for waiting time equal 33.3 per year waiting time (i.e. 0.091 points per day waiting).

There is no limit on the time accumulated on the waiting list, thus, waiting time points can be accrued unrestrictedly.

4.2.2.3.2 Return of waiting time

A recipient who is re-registered for a kidney transplant with one or more immediate previous kidney transplantations having failed, requiring maintenance dialysis within 3 months after the transplantation is eligible for the return of waiting time.

待機期間は 33.3/年で 10 年では 333 点、日本では 10 年で 10 点、17 年で 14 点
また 3 か月以内に移植腎が廃絶された場合は待機期間が移植前と同じ待機期間になる。

4.2.6 Eurotransplant Senior Program (ESP/ESDP)

The Eurotransplant Senior Program (ESP) allocates kidneys from post-mortem donors ≥ 65 years old to recipients ≥ 65 years without the use of a donor HLA typing. The ESP aims at a cold ischaemic period (CIP) that is as short as possible.

心停止下の献腎ドナーが 65 歳以上の場合は、HLA の適合度と関係なく、65 歳以上のレシピエントに斡旋する。

4.2.8 Donors <5 years and en-bloc procurement⁵

Transplant coordinators (TC) are advised to contact ET as soon as possible if they have a donor younger than 5 years. The donor procedure should be discussed together with the ET medical officer.

4.2.8.1 Donors <2 years

From donors under the age of 2 years the kidneys **must** be procured en-bloc.

4.2.8.2 Donors between 2 and 5 years

From donors between 2 and 5 years of age it is recommended to procure the kidneys en-bloc.

ドナーが 5 歳以下の場合は Euro Transplant の意思に連絡をとり、摘出方法を検討する。

ドナーが 2 歳未満の時は 2 腎一緒に(en-bloc)摘出されなければならない。

ドナーが 2~5 歳の場合は 2 腎一緒に(en-bloc)摘出されることが推奨されている。

4.3.1 Donors < 16 years of age

First, to AM program recipients (pediatric & adult)

then, to zero (000) HLA-A, -B and -DR mismatch recipients (pediatric & adult), in case of a HLA fully homozygous donor (see 4.2.2.1.3) recipients are ranked from fully homozygous to fully heterozygous. Within each group recipients are ranked according to their point score.

then, to recipients having the pediatric status, ranked according to their point score.

then, to all other HI, I, T and HU recipients ranked according to their point score.

ドナーが 16 歳未満の場合はまず血液型を適合させ、HLAA, B, DR が 000 mismatch の小児および成人の待機患者へ、そして小児の 100 ポイントを加算し、さらに小児では HLA 適合度は 2 倍にカウントされ加算される。その後ポイント数によって斡旋する。まず 000

mismatch が優先され、その後小児のポイントが多く加算され、小児のドナー腎はなるべく小児へ行くようにされている。

4.3.2 Donors \geq 16 years and $<$ 65 years of age

First, to AM program recipients

then, to zero (000) HLA-A, -B and -DR mismatch recipients
in case of a HLA fully homozygous donor (see 4.2.2.1.3): recipients are ranked from fully homozygous to fully heterozygous. Within each group recipients are ranked according to their point score.

then, to HI, I, T and HU recipients ranked according to their point score.

16 歳以上 65 歳未満の献腎はまず血液型を適合させ、その後 HLA A, B, DR が 000 mismatch の患者へ斡旋される。

4.3.3 Donor aged \geq 65 years

4.3.3.1 Eurotransplant Senior program (ESP)

First to recipients aged \geq 65 years:

locally	in Austria, Belgium/Luxembourg, center offer.
regionally	in Germany first in the sub-region of the donor; recipient-oriented (first HU then elective), then in all other sub-regions, recipient oriented (first HU then elective).
nationally	in the Netherlands Croatia and Slovenia recipient-oriented (first HU then elective)

then, according to the ETKAS scheme (see § 4.3.2)

65 歳以上の献腎は 65 歳以上のレシピエントに斡旋される。