

Chapter 4

Kidney

(ETKAS and ESP)

Change record

Date	Author	Version	Change reference
01-08-2022	C.M.Tieken	2022.1	Textual changes and references of policies and recommendations added
16-03-2021	C.M.Tieken	2021.1	Changes: Blood group rules AM Exclusion AM patients of other kidney matches Allocation of ESP after normal match HU kidney indications Waiting time return KALT replaced by KAOO KAOO on ESP match.
03-11-2020	C.M. Tieken	2020.3	Adjustment ESP Hungary and table pending recommendations
17-09-2020	J. de Boer	2020.2	Textual corrections
09-01-2020	J. de Boer	9.0	Introduction of the virtual PRA as the only way to define the sensitization status of a patient (R-TTAC01.10)
05-11-2019	C.M. Tieken	8.2	Adjustment of the ESP in Belgium
26-09-2019	C.M. Tieken	8.1	Adjustment to the current situation on rescue donors ≥ 65 , decision time EA, adjustment recommendation table
26-03-2019	C.M. Tieken	8.0	4.10.4 adjustment of the calculation of balances
20-02-2018	C.M. Tieken	7.0	4.3.3. HU have priority in AM, 4.13 adjustment recommendation table
17-11-2017	C.M. Tieken	6.1	Adjustment 4.3.7
03-10-2017	C.M. Tieken J. Hagnaars	6.0	General revision manual, adding table pending recommendations, R-KAC01.14 and R-KAC05.14, marginal kidneys
11-11-2016	C.M. Tieken	5.2	Textual adjustment and skipping the evaluation of ET Med. staff on HU request with the indication of suicide
28-07-2016	C.M. Tieken	5.1	Outdated screening time adjusted
26-02-2016	C.M. Tieken	5.0	Frequency table update, adding Belgium waiting time return after living donor transplant
09-04-2015	C.M. Tieken	4.3	Change name code of conduct in kidney audit procedure
05-01-2015	J. de Boer	4.2	Revision Table 4.7.1.,
23-07-2014	C.M. Tieken	4.1	New paragraph(introduction),revision other paragraphs
03-03-2014	C.M. Tieken	4.0	Revision manual and removal ESDP program
04-11-2013	J. de Boer	3.2	Erratum calculation Regional balance Austria
20-06-2013	J. de Boer	3.1	Added Hungary as new member state
08-03-2013	J. de Boer	3.0	Textual adjustments, NHB→DCD
31-01-2013	J. de Boer	2.0	Adding; 1. Bonus for patients having donated one of their own kidneys 2. Exception on the no serum-no offer rule, HU patients with entered unacceptable antigens.
20-06-2012	J. de Boer	1.9	Change policy on donors aged ≥ 75 years

Date	Author	Version	Change reference
23-02-2011	J. de Boer	1.8	Erratum pediatric status: proof of maturation Return waiting time after living donor transplant Kidney after liver transplant
26-11-2010	J. de Boer	1.7	Adaptation: 1. HU Audit procedure adapted 2. pediatric status and pediatric bonus 3. definition return of waiting time 4. ABO blood group rules 5. ESP scheme for Germany Adding: 1. Definition of maintenance dialysis 2. Audit procedure proof of maturation 3. ESDP allocation scheme
18-09-2009	J. de Boer	1.6	Simplified overview pediatric bonus Priority for Kidney-non renal candidate patients within AM program and regional Kidney Exchange Balance Austria added
23-03-2009	J. de Boer	1.5	Adaptation of point assignment for waiting time and distance according to RKAC01.08
22-12-2008	J. de Boer	1.4	Correction ABO rules Germany Change in HU audit
17-03-2008	J. de Boer	1.3	Adaptation of definition of a pediatric transplant candidate/ pediatric point
19-09-2007	J. de Boer	1.2	Adaptation ABO blood group frequency
13-08-2007	J. de Boer	1.1	Adding: 1. Croatia Added as Eurotransplant member state Adaptation 1. calculation National Kidney exchange balance 2. ABO selection ESP and 000 HLA mismatches Germany 3. Rules concerning Positive preliminary cross match 4. Allocation sequence 000 HLA mismatched patients in case of fully HLA homozygous donors 5. Allocation sequence for donors age < 10 years 6. flow charts ETKAS 7. HLA antigen frequency table
01-01-2007		1.0	Start of change record

The Eurotransplant Manual contains the rules and regulations for the implementation and specification of national legislation and national guidelines for waiting list management, organ procurement and allocation. It has been prepared with the best of knowledge and the utmost care. In case of discrepancies between the content of this manual and national binding provisions, the following applies:

- Insofar, as provisions about the acceptance of organ patients to the waiting list are concerned, this manual has only an informative character. Only the national provisions which are applicable for the transplant centers are relevant and legally binding.
- For the allocation of organs only the national provisions are legally binding. The display of the allocation provisions in this Manual are based on these legally binding national provisions. As far as necessary, they have been specified by Eurotransplant in this Manual. Deviations from such specifying Eurotransplant provisions cannot be considered as a breach of the national provisions as long as the latter are not violated. Eurotransplant cannot be held liable for a potentially wrongful description in this Manual of procedures, in connection with the organ allocation, as long as the actual allocation follows national provisions.

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4.1 Introduction kidney allocation

4.1.1 General

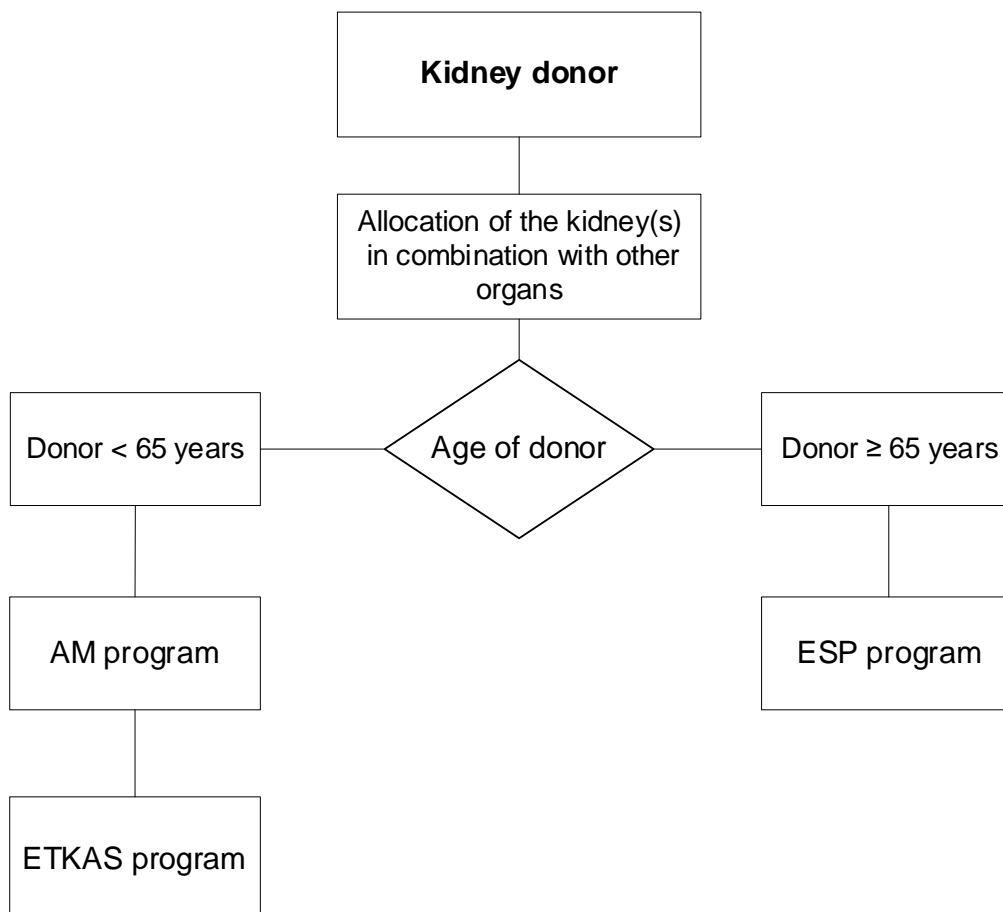
This chapter contains information concerning the allocation of kidneys within Eurotransplant (ET). First, a flowchart of the general kidney allocation is presented. Additionally, kidney allocation related definitions are explained. In the following paragraphs, more information about the urgency codes, blood group rules, acceptable mismatch (AM) program, point score system, the allocation algorithms of the ETKAS and ESP allocation can be found.

For general information concerning kidney patient registration or reporting of donors to Eurotransplant, please see Chapters 2 The Recipient and 9 The Donor of the ET Manual respectively.

Definitions can be found via the following link [Definitions](#).

4.1.2 Flowchart kidney allocation

The flowchart below shows the general scheme of the kidney allocation.



4.2 Kidney - urgency codes

A patient for a kidney is a person who has an end-stage renal disease. The urgency codes are used to classify patients on the waiting list and to prioritize these patients on the match list. The urgency codes represent the aspects of transplantability, medical urgency and the most recent level of allo-sensitization¹ in ENIS (see Table 1).

Urgency codes used in Kidney allocation						
Urgency code		Transplantability	Medical urgency	allo-sensitization: virtual PRA (vPRA)		
HU	High Urgency	yes	urgent	0-100		
T	Transplantable	yes	normal	no	vPRA	0
I	Immunized	yes	normal	yes	vPRA	>0
NT	Not Transplantable	no	no			
R	Removed	no	no			

Table 1, Urgency codes

4.2.1 High urgency (HU) Kidney status

In specific medical situations a HU status can be requested. Below you will find the inclusion criteria. A different set of HU inclusion criteria are present for Germany and non-German countries.

4.2.1.1 All countries; HU inclusion criteria²

- Imminent lack of access for either hemodialysis or peritoneal dialysis.
- Severe bladder problems (hematuria, cystitis etc.) due to kidney graft failure after simultaneous kidney + pancreas transplantation, the pancreas graft is bladder-drained and functioning adequately.

4.2.1.2 Change in the clinical situation of a patient with HU status

If the clinical situation of a patient improves, the transplant center should place the patient in any lower urgency status. Patients in HU status who become (temporarily) not transplantable have to be reported as NT. If these patients become transplantable again, a new HU request must be sent to Eurotransplant.

4.2.2 HU status request

For more information on the request for HU kidney, please see [Kidney – high urgency request](#).

¹ R-TTAC01.10: In order to have a uniform and reliable parameter for sensitization in ET, the v-PRA value (based on the phenotype frequency of the unacceptable mismatches) will replace the %-PRA value.

² R-KAC01.19 - Indications for high urgent kidney transplantation

4.3 General information on the allocation of kidneys

In ([Flowchart kidney allocation](#)) the flowchart can be found about the general allocation order. The first step in this figure is that kidneys are offered to patients in need for a combined organ transplant including kidney. These patients will get the offer of the combined organs via the leading organ (For further information concerning this subject, please see Chapter 3 Allocation General of the ET Manual). The kidney only allocation can be started if one or both kidneys are still available. If the donor is < 65 years old, the AM + ETKAS match is started. In case of a donor ≥ 65 years old, the ESP match will be generated.

4.3.1 AB0 blood group rules

AB0-incompatible kidney transplants from postmortem donors are not allowed.

4.3.1.1 AM program³

Donor blood group	Eligible patients
A	A and AB
B	B
AB	AB
O	B and O

Table 2, Blood group rules in AM program

4.3.1.2 ESP, ETKAS

Donor blood group	Eligible patients
A	A
B	B
AB	AB
O	O

Table 3, Blood group rules ETKAS-ESP program

4.3.2 Donation after circulatory death (DCD) kidneys

4.3.2.1 DCD type II⁴

Kidneys of DCD type II donors are allocated according to the following scheme:

Donors <65 years (HLA typing must be performed)

1. 000 MM (national only)
2. Donor center offer
3. Extended allocation (EA) – first line extended (national)
4. Second line rescue (international)

Donors ≥65 years

1. Donor center offer
2. Extended allocation (EA) – first line extended (national)
3. First line rescue
4. Second line rescue (international)

³ R-KAC02.17 - blood group rules in kidney allocation, implemented March 16, 2021

⁴ R-KAC05.14 – allocation DCD type II; board approval, Jan 2015

4.3.2.2 DCD type III

Kidneys for donation after cardiocirculatory death (DCD) type III are allocated according to the same algorithm as for kidney donation after brain death (DBD) in the countries in which it is legal and ethical allowed.

For further information concerning this subject, please see Chapter 9 of the ET manual.

4.3.3 Acceptable Mismatch (AM) program

The Acceptable Mismatch (AM) program aims to allocate organs to patients who are immunologically compromised because of current and/or historical HLA-sensitization, to increase their chances on an organ.

The program identifies HLA mismatches that most likely will not result in a positive cross match. The Eurotransplant Reference Laboratory (ERTL) will check the HLA antigens to which the patient has not yet reacted to with allo-antibodies and therefore might be acceptable for the patient. Patient that are included in the AM program will be excluded from other kidney allocation programs.⁵

Patients selected by this program have priority over ETKAS-selected patients. Within the AM program, patients awaiting a combined kidney-non renal transplant have priority over kidney only patients. Thereafter patients that have HU kidney status will be prioritized above non-HU kidney only patients. For more information see Chapter 10 Histocompatibility and in the background information, see [Acceptable Mismatch \(AM\) program – background information](#).

4.3.4 Eurotransplant Kidney allocation system (ETKAS – donors < 65 years)

The selection of potential patients is based on ABO blood group rules. The ranking of these patients is based on age, medical urgency, mismatch probability, HLA-A, -B, -DR matching between donor and patient, waiting time and donor region.

After the AM patients 000 MM patients are ranked on top according of a point score and thereafter other selected potential patients are ranked according of a point score system. The patient with the highest score is ranked on top and receives the first offer. The score is calculated for all patients, including 000-mismatched (MM) patients in order to rank the 000-mismatched patients among each other.

For detailed information of the point score system, see [ETKAS - Point score system](#).

For detailed information of the allocation scheme see [ETKAS – allocation algorithms](#)

4.3.5 Eurotransplant Senior Program (ESP - donors ≥ 65 years)

The aim of the ESP is to decrease the cold ischemic period (CIP) of the kidney. Therefore, the Eurotransplant Senior Program (ESP) allocates kidneys from post-mortem donors ≥ 65 years old to patients of ≥65 years without the use of a donor HLA typing (excl. Netherlands, Belgium/Luxembourg and Hungary; the match in these countries is generated after reporting of the HLA). The patients are selected locally, regionally, or national and ranked based on urgency⁶ and waiting time (dialysis time). Immunized patients are included in the ESP –match list. In case the donor HLA typing is present before the ESP match is generated, unacceptable antigens are considered. In case the organs are not accepted via the normal ESP match list the allocation will be changed to extended allocation followed by second- and third line rescue.⁷

⁵ R-TTAC02.15 - Choice for AM vs ETKAS and,or ESP, implemented March 16, 2021

⁶ R-KAC04.20 - Prioritization for HU and KAOO patients on the ESP match list, implemented March 16, 2021

⁷ R-KAC02.14 - allocation ESP, kidneys implemented March 16, 2021

For patients that are eligible for rescue offers of kidneys from donors of 65 years and older the donor profile item “extended allocation ESP” must be set to yes.

For detailed national ESP allocation rules see [National allocation rules in the ESP](#)
For detailed information concerning the allocation scheme, see [ESP allocation algorithms \(Donor aged ≥ 65 years\)](#).

4.3.6 Choice of allocation program in Germany

In Germany, patients that are 65 years or older have to choose for either being included in the ESP or the ETKAS program. These programs are mutually exclusive.

4.3.7 Donors ≤ 5 years and en-bloc procurement

4.3.7.1 Donors <2 years

From donors under the age of 2 years the kidneys **must** be procured en-bloc. It is not mandatory to transplant the kidneys en bloc. It is up to the transplant center to take a decision whether they transplant 1 or 2 kidneys.

4.3.7.2 Donors ≥ 2 and ≤ 5 years

From donors ≥ 2 and ≤ 5 years old it is recommended to procure the kidneys en bloc. For further information concerning the procurement of the kidneys, please see Chapter 9 The Donor of the ET manual.

4.3.8 Donors aged ≥65 years, logistic reason to start rescue

P-KAC05.19 – Logistic reason to start rescue of kidneys from ESP donors⁸

Rescue allocation of kidneys from donors ≥ 65 years can be started if the organ has not been accepted for any patient within 5 hours after procurement or declined > 5 centers.

4.3.9 Donors aged ≥75 years

Only in case of a rescue allocation for a donor ≥75 years old, the transplant center has the possibility to transplant both kidneys into one patient. In all other cases a single kidney transplant is preferred, but en bloc transplantation might be possible based on the quality of the kidneys.

4.3.10 Marginal kidneys

The following kidneys are marginal kidneys, therefore direct deviation of the normal allocation is acceptable to prevent loss of these organs:

1. A transplanted kidney with a good function which has to be taken out of the living recipient/donor. This kidney can be offered to the center where the living recipient/donor is located.
2. Kidneys of HIV positive donors will be allocated via deviant allocation rules.⁹
3. Kidneys of donors ≤ 5 years of age¹⁰. These organs will first be offered to only one transplant center via the match list. This center can decide to transplant one or both kidneys.

⁸ P-KAC05.19 – Logistic reason to start rescue of kidneys from ESP donors; board approval, May 2019

⁹ P-KAC06.19 – Allocation of kidneys of HIV positive donors, board approval, May 2019

¹⁰ P-KAC01.17 – Allocation of kidneys of donors ≤ 5 years of age; board approval, Oct. 2017

4.3.11 Decision time in the recipient-oriented rescue allocation of kidneys

In non-German countries the decision time in the recipient-oriented rescue allocation is 60 minutes. In Germany the decision time is 30 minutes.¹¹

4.3.12 Prospective crossmatch

4.3.12.1 Prospective preliminary crossmatch

Donor tissue typing laboratories are obliged to perform crossmatches as ordered by either ET (non-German) countries or the DSO (Germany).

In case of a positive preliminary crossmatch, no kidney offer will be made to a patient, or a conditional offer is withdrawn.

4.3.12.2 No serum available for preliminary crossmatch

If a preliminary cross-match cannot be performed because no serum is available, no kidney offer can be made to a patient or the conditional offer is withdrawn, except in case of an immunized (for definitions, see [Definitions](#)) HU patient for whom unacceptable antigens are entered into the system.

4.3.13 HLA-Typing

For more information on HLA typing, see [HLA-Typing](#) and Chapter 10 Histocompatibility Testing of the ET Manual.

4.4 ETKAS - Point score system

This paragraph will describe information concerning the point score system for generating the match list for kidney patients.

For background information on the point score system see

For the allocation scheme, [ETKAS – allocation algorithms](#)

4.4.1 000 MM

After the AM patients first the patients with a 000-MM are ranked according to their point score.

¹¹ P-KAC02.18 – Decision time in the recipient-oriented rescue allocation (EA) of kidneys, Jan 2019

4.4.2 Point assignment HLA

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

4.4.2.1 HLA-bonus for pediatric patients

For pediatric patients, the points for HLA-antigen mismatch are doubled (see [Pediatric bonus](#)).

4.4.3 Mismatch Probability (MMP)

Mismatch Probability is a calculation of the probability of receiving a kidney offer with 0 and 1 *broad* HLA-A, -B or *split* DR mismatches based on 1000 kidneys offered, considering ABO blood group rules and vPRA. Patients receive between 0-100 MMPs. Detailed information, see [Mismatch Probability \(MMP\) detailed information](#).

4.4.4 Waiting time

Upon registration on the kidney waiting list, the initial date of start of maintenance dialysis (no interruption of dialysis > 90 days) of the patient is counted. For patients that are re-registered the date of re-institution of maintenance dialysis after previous kidney transplantation is counted as the first day for the calculation (start of the waiting time). Per year waiting time, 33.3 points are given (i.e. 0.091 points per day waiting). Waiting time points can be accrued unrestrictedly.

4.4.4.1 Pre-emptive patients

It is possible to register pre-emptive patients (exclusion of Germany) on the active Eurotransplant kidney waiting list. These patients do not receive points for waiting time. Please be aware that there might be different national rules concerning the registration of pre-emptive patients on the waiting list.

4.4.4.2 Return of waiting time after transplantation

For detailed information, see [Waiting time – return waiting time](#).

4.4.5 Pediatric bonus

4.4.5.1 Germany¹²

In Germany, the pediatric bonus is given till 18 years if they fulfill the registration criteria of Germany. At the age of 18 the patient loses the pediatric bonus. There is no maturation status in Germany.

4.4.5.2 Other countries

A transplant candidate is defined pediatric if:

1. Dialysis started before the 16th birthday *or*
2. Registration on the waiting list was before the 16th birthday and dialysis started before the 17th birthday *or*
3. Patient is proven to be in maturation.

Each pediatric transplant candidate is assigned a pediatric bonus of 100 points.

For pediatric patients the points for HLA-antigen mismatch are doubled.

Delivering and auditing proof of maturation, see [Pediatric bonus - Delivering and auditing proof of maturation](#).

4.4.6 Distance between donor center and transplant center

	Austria	Belgium / Luxemburg	Croatia	Germany	Hungary	The Netherlands	Slovenia
Local Equivalent	200	200 (also eq)					100
Regional				200			100
National	100	100	300	100	300	300	100

The total amount of points given to national patients is composed from national points plus, if applicable, the local or regional points.

4.4.7 National and regional Kidney Exchange Balance

The following balances are calculated in the point score

-National Balance Points = (highest import balance – recipient country balance) x 30

-Regional Balance Points¹³ = 0.25x (Austrian National Balance - Regional Balance)

For detailed information, see [National Kidney Exchange Balance – detailed information](#).

4.4.8 High Urgency

Patients for which the HU status is approved will receive a bonus of 500 points.

Please Note: the required HLA mismatch profile criteria is not considered when the patient has the HU status.

¹² Richtlinie gemäß § 16 Abs. 1 S. 1 Nrn. 2 u. 5 TPG für die Wartelistenführung und die Organvermittlung zur Nierentransplantation. Published by the Bundesärztekammer (www.baek.de).

¹³ Please note the Regional Balance Points can be negative, which means a deduction of the total pointscore

4.4.9 Kidney after other organ transplant (KAOO)

In addition to the option of performing a simultaneous other organ-kidney transplant the option of transplanting first the other organ and the kidney at a later time is possible in selected cases (i.e. a kidney-after-other organ transplant).

Patients fulfilling the criteria will receive 500 bonus points.

Criteria, see 4.10.5

4.4.10 Bonus for patients having donated one of their own kidneys

Patients suffering from end stage renal disease after having donated one of their own kidneys will be granted once-only an allocation bonus of 500 points upon registration on the waiting list. In exceptional cases, upon request of the transplant center, this bonus can be granted a second time. Each request for a repeated bonus should be well motivated and will be evaluated by all ETKAC members.

4.4.10.1 Deviant national regulations; Germany

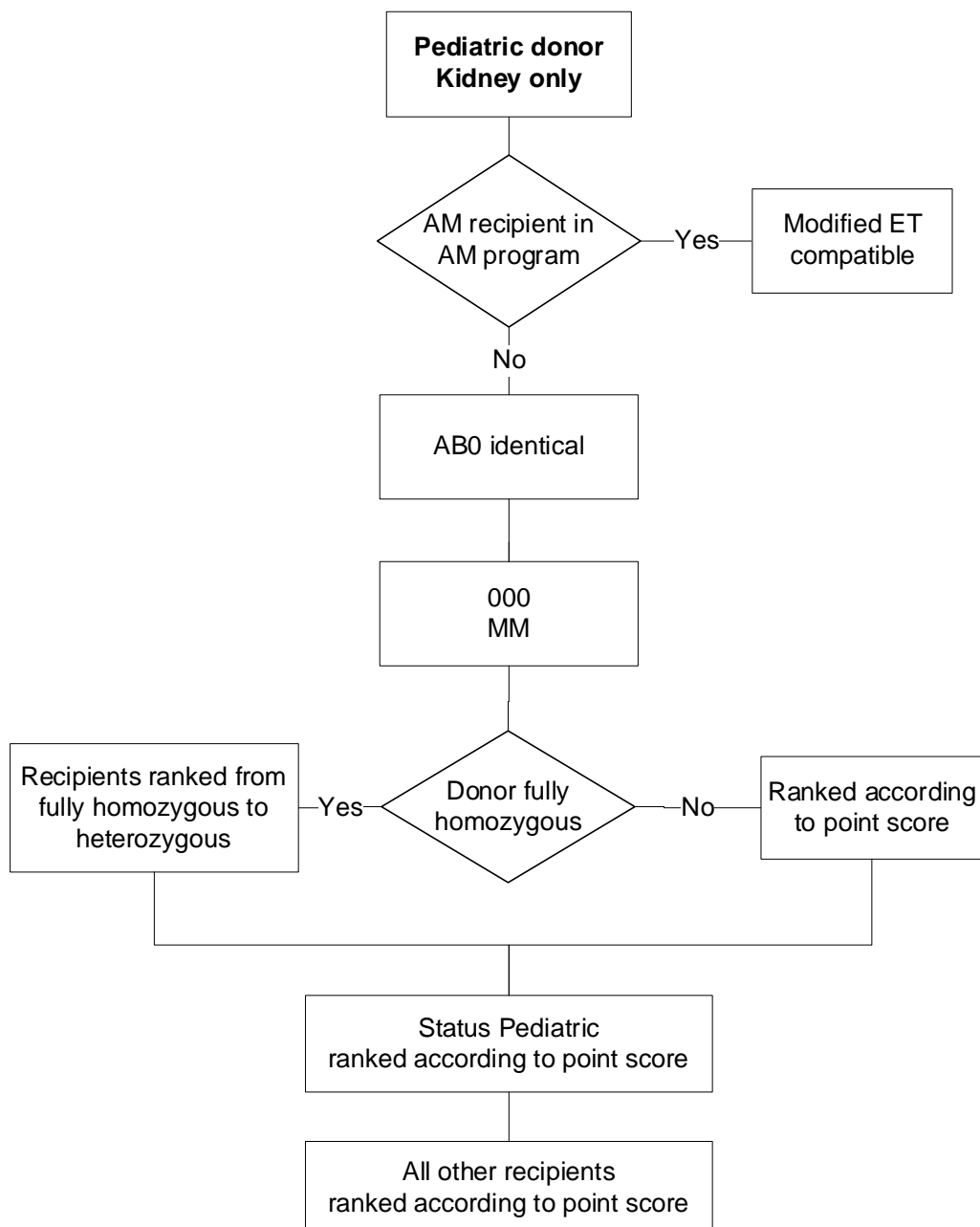
Granting this bonus has not yet been accepted by the German national authorities.

4.5 ETKAS – allocation algorithms

4.5.1 Donors < 16 years old

First, to AM program patients (pediatric & adult)
 then, to zero (000) HLA-A, -B and -DR mismatch patients (pediatric & adult)
 in case of a HLA fully homozygous donor patients are ranked from fully homozygous to fully heterozygous. Within each group, patients are ranked according to their point score.
 then, to patients having the pediatric status, ranked according to their point score.
 then, to all other I, T and HU patients ranked according to their point score.

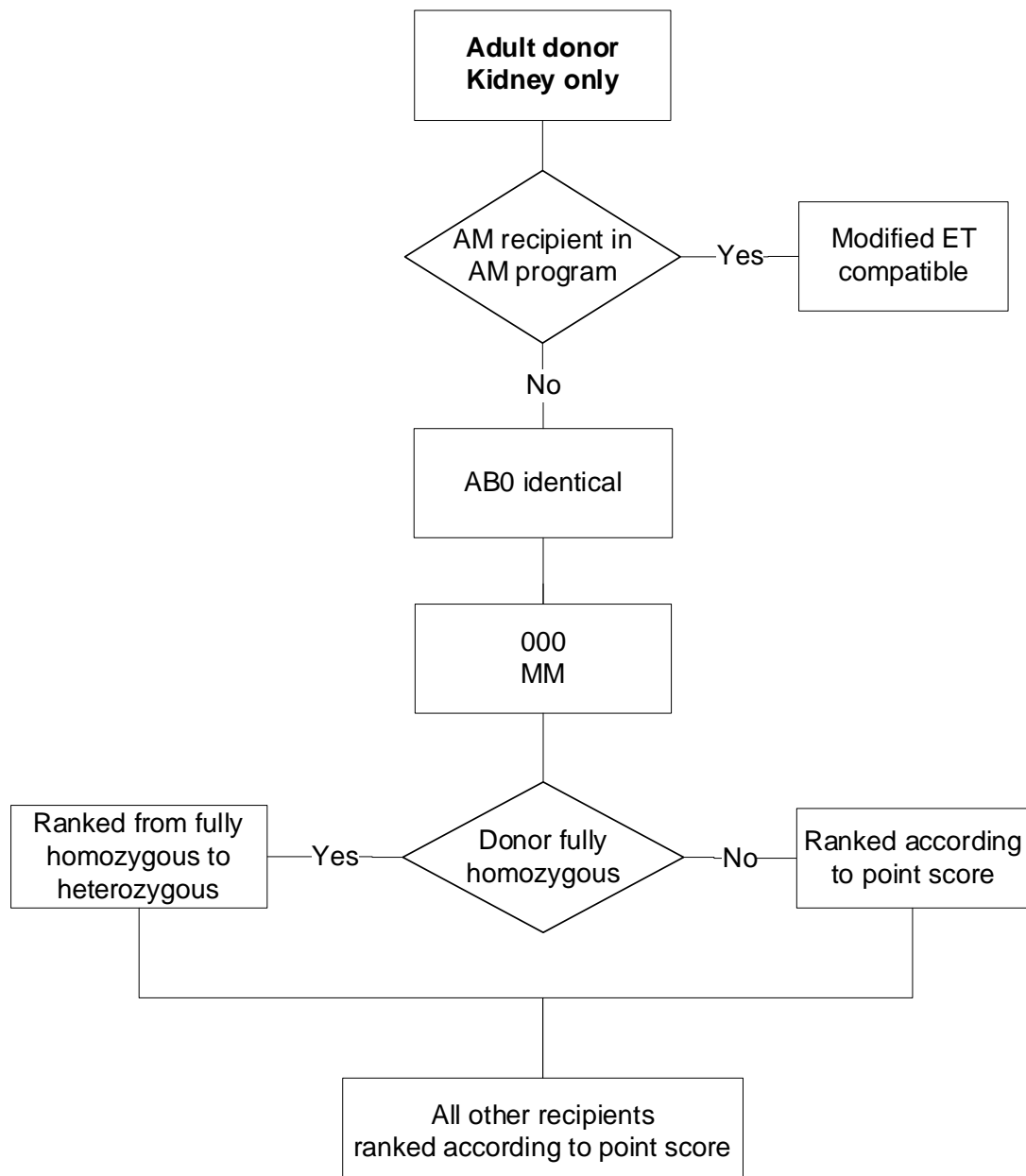
4.5.2 Flowchart 1 – Donor < 16 years



4.5.3 Donors ≥ 16 years and < 65 years of age

First, to AM program patients
 then, to zero (000) HLA-A, -B and -DR mismatch patients
 in case of a HLA fully homozygous donor (see [Fully homozygous](#)): patients are ranked from fully homozygous to fully heterozygous. Within each group patients are ranked according to their point score.
 then, to I, T and HU patients ranked according to their point score.

4.5.4 Flowchart 2 – Donor ≥ 16 years and < 65 years



4.6 ESP allocation algorithms (Donor aged ≥ 65 years)

4.6.1 Eurotransplant Senior program (ESP)

First, a patient oriented allocation to local, regional or national patients aged ≥ 65 years; first HU then KAOO followed by elective ranked on waiting time (=dialysis time):

Austria → Locally or equivalent

Germany → First subregion (see [German ESP \(sub\) regions](#)) then other subregions within that coordination region in Germany

Hungary → Region of the donor before nationally

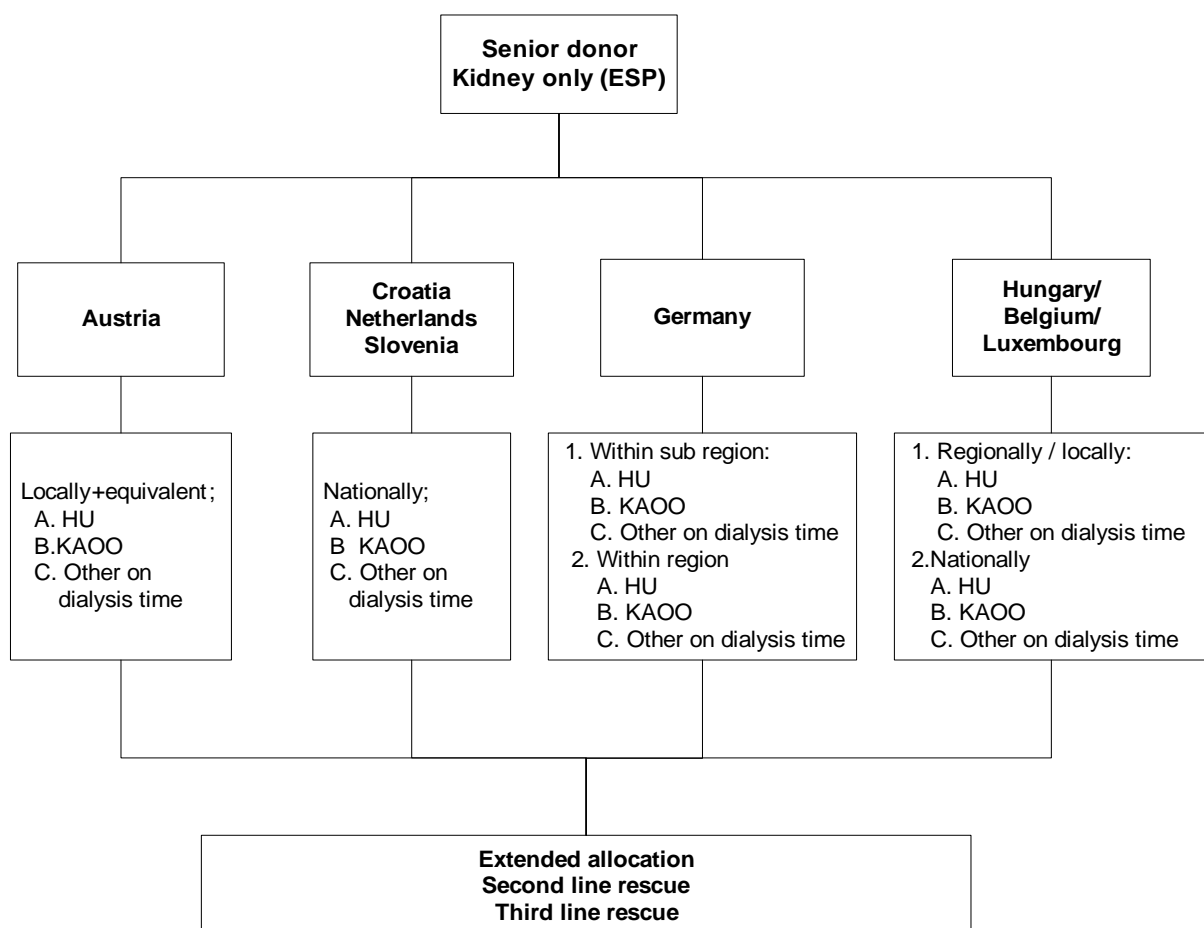
The Netherlands, Croatia and Slovenia → Nationally

Belgium/Luxembourg → Local center of the donor before national

Then, according to rescue allocation:

First Extended allocation followed by second and third line rescue.

4.6.2 Flowchart 3 – Donor ≥ 65 years



4.7 Background information on the kidney allocation

4.7.1 Definitions

Below, definitions related to the kidney allocation can be found. For the definitions concerning the urgency codes, please see [Kidney - urgency codes](#) urgency codes.

4.7.1.1 Maintenance dialysis

The dialysis has not been interrupted for more than 90 days.

4.7.1.2 Fully homozygous

Inheritance of two identical HLA antigens at each polymorphic locus.

4.7.1.3 Fully heterozygous

Inheritance of two different HLA antigens at each polymorphic locus.

4.7.1.4 Full house identical

The donor and patient have both 6 different HLA antigens of which all antigens are the same, e.g.:

Donor typing	A1 A2 B7 B8 DR1 DR13
Patient typing	A1 A2 B7 B8 DR1 DR13

4.7.1.5 Zero mismatch identical

The donor and patient have the same amount of HLA antigens but less than 6, of which all antigens are the same, e.g.:

Donor typing	A1 A2 B7 B8 DR1 -
Patient typing	A1 A2 B7 B8 DR1 -

4.7.1.6 Zero mismatch compatible

The donor has less HLA antigens than the patient, but the patient has all of the donor HLA antigens, e.g.:

Donor typing	A1 - B7 B8 DR1 -
Patient typing	A1 A2 B7 B8 DR1 DR13

4.7.1.7 Outdated screening

Outdated screenings are those HLA-specific antibody screening results that are older than 180 days at time of matching. Patients with outdated screening are not selected in matching procedures.

4.7.1.8 Local(ly)

Patients from the same center as the donor center.

4.7.1.9 Equivalent-local(ly)

Equivalent to a local status are patients from collaborating transplant programs (regional or national).

4.7.1.10 Regional(ly)

One or more transplant centers in the same region of the donor center. Such a region can consist of one or more transplant programs. (e.g. In Germany the seven regions are consistent with the seven donor regions defined by the organ procurement organization Deutsche Stiftung Organtransplantation (DSO)).

4.7.1.11 National(ly)

All transplant programs in the same country (but outside the region) of the donor center.

4.7.1.12 International

All transplant programs outside the country of the donor center.

4.7.1.13 Export

i.e. a negative balance, is defined as: kidneys procured in a country > kidneys transplanted in that country.

4.7.1.14 Import

i.e. a positive balance, is defined as: kidneys procured in a country < kidneys transplanted in that country.

4.7.1.15 Transplantable (T)

Elective patients who are transplantable and have a vPRA of 0%.

4.7.1.16 High Urgency (HU) patients

Patients who are according to the criteria and/or accepted by the international ETKAC audit approved for a high urgent status.

4.7.1.17 Immunized (I) patients

Patients who are transplantable and have a vPRA of >0%.

4.7.1.18 Not Transplantable (NT) patients

Patients temporarily not transplantable should be placed in urgency NT.

4.7.1.19 Removed (Urgency R)

A patient should be removed (Urgency R) from the waiting list if the patient is deteriorated beyond transplantability.

4.7.1.20 Pre-emptive patients

Patients that are listed on the waiting list but have not yet started their dialysis.

4.8 Kidney – high urgency request

4.8.1 HU status request

A remote center cannot assign a HU status in ENIS, but they have to send a request to Eurotransplant. For requesting a HU status for a patient, the form “Kidney High Urgency form” should be used (see Forms at www.eurotransplant.org). Please be aware that only HU requests are considered in case the patient is placed on an active urgency status.

The Urgency form must be send to Eurotransplant (urgency@eurotransplant.org) and has to be accompanied by an English letter of motivation and additional medical reports. Depending on the HU inclusion criterion related to the patient, a report from one or two competent specialist(s) in the field of the indication must be included (see form). Additionally, information concerning a consideration of a living donor should be added.

4.8.2 HU audit

The HU request with a standard indication will initially be evaluated by two members of the Eurotransplant Kidney Advisory committee. In case of a split decision, a third member of the Eurotransplant Kidney Advisory committee will be consulted for a final judgment. Only after approval, the HU status will be granted, and the urgency will be changed in ENIS by the Eurotransplant waiting list officer.

In case of the indication “other” the request is sent to all auditors and the request is accepted when 2/3 of the eligible members supports the request.

Doctors involved in the audit procedure should follow the “Kidney audit procedure” which is published on the ET member site (see library→ manuals→ Eurotransplant manual→kidney audit procedure).

4.8.2.1 Objection

If the HU request is declined by the audit and the requesting center does not agree with the auditors’ decision, only one objection can be sent. The requesting center should indicate that the auditors overlooked information or provide additional information that is of importance for the decision of the auditors. The objection must be submitted to Eurotransplant within 5 working days after the initial decline of the request. The objection letter should be written in English and also summarizes other information (e.g. letters of specialists). The objection will be to the ETKAC for mail voting.

4.9 General background information

4.9.1 HLA-Typing

The HLA match program is only based on the HLA-A, -B and -DR loci. The HLA-C and -DQ antigens, as well as the public antigens of the HLA-B and -DR loci are disregarded from HLA mismatch calculation program.

4.9.1.1 Conversion of HLA-A and –B typing

The HLA broad match phenotype reduction program converts the HLA-A and -B from *split* HLA-antigen to *broad* HLA-antigen for matching the donor with the patients (see [Conversion of split HLA-antigen to broad HLA-antigen](#)).

4.9.1.2 Conversion of HLA-DR typing

- If a donor with HLA-DR broad antigens is reported to ET without splits, patients will be selected on broad antigen level;
- If a donor with HLA-DR split antigens is reported to ET, patients will be selected on split antigen level. The only exclusion to this rule concerns split antigens DR17/DR18, because they are difficult to distinguish. Donors with HLA-DR 17 or 18 antigens will be matched on broad DR3 antigen level.

4.9.1.3 Calculation of HLA mismatches

The *HLA mismatch program* calculates HLA-antigen mismatches for HLA-A and -B based on **broad** antigens only. HLA-antigen mismatches for HLA-DR are calculated based on **split** HLA antigens.

Mismatches are defined as donor HLA-antigens that are different from the patients HLA-antigens. The converted HLA-typing is only accepted by the HLA-mismatch calculation program in the presence of at least 1 HLA-antigen on each of the three HLA-loci, HLA-A, HLA-B and HLA-DR. For HLA-A and -B, the broad is leading. For HLA-DR, the split is leading.

In case only 1 HLA-antigen is identified (on the A-, B- or DR-locus), the donor or the patient is assumed to be 'homozygous' for that locus (i.e. homologous chromosomes are presumed to code for identical antigens at that locus).

Calculation for homozygous locus of a donor:

Donor typing	A1 -
Patient typing	A28 A2

In this case only 1 mismatch is calculated.

In case there are 2 identical antigens on one locus, so only on A-, B- or DR-locus, only 1 mismatch is calculated

Calculation for 2 identical antigens on 1 locus of a donor:

Donor typing	A9 A9
Patient typing	A28 A2

Calculation: Only 1 mismatch is calculated

4.9.2 Acceptable Mismatch (AM) program – background information

For more information, see Chapter 10 Histocompatibility Testing in the ET Manual.

4.9.2.1 Inclusion criteria

The criteria can be found in Chapter 10 Histocompatibility (§ 10.3) in the ET Manual.

4.9.2.2 Minimum requirements for organ offers

The AM program will run for every ETKAS match of a post-mortem kidney donor with a known HLA typing. The program selects potentially cross-match negative AM patients.

4.9.2.3 Contact with immunologist from the ETRL

All eligible AM-patients are presented to and discussed with an ETRL immunologist prior to a kidney offer.

4.9.2.3.1 Effect of judgment by ETRL immunologist

In case an immunized patient is selected through:

- The AM program: The judgment of the ETRL immunologist is binding. If the judgment is negative, then **no** offer is made for this patient. If the judgment is positive, an offer is made for this patient. No prospective cross match is performed.

4.9.3 ESP - donors \geq 65 years - background information

4.9.3.1 National allocation rules in the ESP

4.9.3.1.1 Austria

In Austria kidneys from ESP donors are allocated to ESP patients from the reporting center's local waiting list (=donor or equivalent center).

4.9.3.1.2 Germany

In Germany, kidneys from ESP donors are allocated to ESP patients from the corresponding region. These regions are defined by the organ procurement organization Deutsche Stiftung Organtransplantation (DSO) ([German ESP \(sub\) regions](#)). Kidneys from ESP donors are first allocated to ESP patients registered within the same sub-region as the donor and then to ESP patients registered within the other sub-regions within that coordination region in Germany

4.9.3.1.3 Hungary

In Hungary, the ESP match can only be generated in case the HLA of the donor is known. Kidneys from ESP donors are first allocated to local ESP patients registered within the same region (= donor center, HBSTP, HDBTP, HSZTP or HPCTP) as the donor and then to ESP patients registered nationally.

4.9.3.1.4 The Netherlands,

In the Netherlands, the ESP match can only be generated in case the HLA of the donor is known. The kidneys from ESP donors are allocated to ESP patients according to the national waiting list.

4.9.3.1.5 Croatia, Slovenia

In the Croatia and Slovenia, kidneys from ESP donors are allocated to ESP patients according to the national waiting list.

4.9.3.1.6 Belgium/Luxembourg

The ESP match can only be generated in case the HLA (only for Belgium) of the donor is known. In Belgium, kidneys from ESP donors are first allocated to local ESP patients (= donor center) as the donor and then to ESP patients registered nationally.

4.10 ETKAS - Point score system - background information

This paragraph will describe detailed information concerning the point score system for generating the match list for kidney patients. For the allocation scheme, see [ETKAS – allocation algorithms](#).

4.10.1 Mismatch Probability (MMP) detailed information

Mismatch Probability is a calculation of the probability of receiving a kidney offer with 0 and 1 *broad* HLA-A, -B or *split* DR mismatches based on 1000 kidneys offered, taking into account AB0 blood group rules and vPRA. Patients receive between 0-100 MMPs.

4.10.1.1 MMP for 0 or 1 HLA mismatch

The *broad/split* HLA-antigen frequencies, necessary for the calculation of the 0 and 1 HLA MMP, have been calculated on the ETRL Database ([HLA antigen frequency](#)).

The MMP for 0 and 1 HLA is determined at the moment of listing on the kidney waiting list. The lower the calculated value for 0 + 1 HLA-MMP (MMP0 + MMP1), the higher the chance of finding a donor with 0 or 1 HLA-mismatches within the Eurotransplant pool.

4.10.1.2 Antibody screening

The antibody screening is recently entered in ENIS and must not be outdated (see [Outdated screening](#)). Screenings should be updated every 180 days.

If a possible sensitization can take place between regular antibody screening dates, additional antibody screenings should be performed according to the ETRL guidelines.

A higher vPRA indicates a lower chance of finding a donor with a negative cross-match.

4.10.1.3 MMP formulas

All variables are equal to the **broad** HLA-A and –B and **split** HLA-DR frequencies in

$$\text{MMP} = 100 \times (1 - (\text{AB0-match frequency} \times (1 - (\text{vPRA} / 100))) \times (\text{MMP0} + \text{MMP1}))^{1000}$$

$$\text{MMP0} = (a1+a2)^2 * (b1+b2)^2 * (dr1+dr2)^2$$

$$\text{MMP1} = \text{MMP0} \times \left(\frac{(((2*(a1+a2)*(1 - a1 - a2)) - a1^2 - a2^2 + \sum (\text{all HLA-A Ag frequencies}^2)) / ((a1+a2)^2)) + ((2*(b1+b2)*(1 - b1 - b2)) - b1^2 - b2^2 + \sum (\text{all HLA-B Ag frequencies}^2)) / ((b1+b2)^2)) + (((2*(dr1+dr2)*(1 - dr1 - dr2)) - dr1^2 - dr2^2 + \sum (\text{all HLA-DR Ag frequencies}^2)) / ((dr1+dr2)^2))}{\text{MMP0}} \right)$$

Parameter	Frequency of
a1	1 st HLA-A antigen
a2	2 nd HLA-A antigen
b1	1 st HLA-B antigen
b2	2 nd HLA-B antigen
dr1	1 st HLA-DR antigen
dr2	2 nd HLA-DR antigen

Parameters a1 - dr2 are derived from the match HLA-typing used for the calculation of the HLA-mismatches.

4.10.2 Waiting time – return waiting time

4.10.2.1 Waiting time return after kidney transplant of deceased donor¹⁴

Return of waiting time will be granted in case a recipient requires maintenance of dialysis within 1 year after the kidney transplantation. The percentage of waiting time points will differ dependent on the date the maintenance of dialysis is started in relation to the transplant date.

- 100 % waiting time return if maintenance of dialysis starts 0 to 91 days after the kidney transplant;
- 75 % waiting time return if maintenance of dialysis starts 92 to 183 days after the kidney transplant;
- 50 % waiting time return if maintenance of dialysis starts 184 to 275 days after the kidney transplant
- 25 % waiting time return if maintenance of dialysis starts 276 to 365 days after the kidney transplant.

Patients that require maintenance of dialysis exceeding 1 year after the kidney transplant do not receive any return of waiting time.

The waiting time return will be calculated automatic in case of entering or changing date of (re) institution of dialysis

4.10.2.2 Waiting time return after kidney transplant of a living donor¹⁵

A recipient who is re-registered for a kidney transplant with one or more immediate previous **living donor** kidney transplantations having failed, requiring maintenance dialysis, is eligible for the return of 100% of the waiting time.

The waiting time return will be calculated automatic in case of entering or changing date of (re) institution of dialysis.

4.10.2.2.1 Deviant rules Netherlands

In the Netherlands for a patient that was transplanted with a kidney of an altruistic donor, the rules concerning return of waiting time after kidney transplantation of a deceased donor apply.

4.10.2.3 Total number of waiting time

The amount of waiting time equals the number of days from the date of

1. Start of dialysis and **no** previous transplant, *or*
Re-institution of dialysis after the last successful transplant.
2. Number of waiting time return based on the rules described in 4.10.2 Waiting time – return waiting time.

¹⁴ R-KAC03.17 - return waiting time, implemented March 16, 2021

¹⁵ R-KAC03.10 – waiting time return after living transplantation, implemented March 16, 2021

4.10.3 Pediatric bonus - Delivering and auditing proof of maturation (non-Germany)

A transplant center must send a completed Kidney patient in maturation form including a report from a competent radiologist or pediatric endocrinologist on an X-ray of the left hand (see Forms at www.eurotransplant.org).

This report must not be older than 3 months at time of “proof of maturation” was requested. The request will be evaluated by two members of the ETKAC. In case there is no unanimous decision, a third member of the ETKAC will be consulted for a final decision. Proof of maturation should be only requested when the onset of maintenance dialysis is after the 17th birthday or the patient is registered on the kidney waiting list after the 16th birthday and not yet being on dialysis.

After the proof of maturation has been accepted, the pediatric status is granted. The status is granted until:

1. The first successful transplant in case the patient is on maintenance dialysis.
2. The first successful transplant in case the maintenance dialysis starts within the first year after registration on the waiting list.
3. For 1 year calculated from date of registration on the waiting list in case the patient is not on maintenance dialysis.

The pediatric status can be re-installed when the patient is still proven to be in maturation at time of onset of maintenance dialysis. The pediatric status will then be granted until the first successful transplant.

4.10.4 National Kidney Exchange Balance – detailed information

As of April 1, 2019 the balance in het ETKAS system will be calculated as according to the following policy:

P-KAC06.17 – Donor categories and balance calculation¹⁶

Kidneys from deceased donors are classified according to donor age categories.

1. Donor age 0-15 years;
2. Donor age 16-49 years;
3. Donor age 50-64 years;
4. Donor age ≥65 years.

These categories will be used in the calculation of the national balances to be used for the balancing factor in ETKAS. The balances increase over time starting at 0 on April 1, 2019.

Once every day, as of April 1, 2019, the difference between the number of kidneys procured, exchanged between each ET country¹⁷ and transplanted, is calculated.

No immediate compensation exists for exchanging kidneys together with non-renal organ(s) from one donor for transplantation into one patient; however, the calculation of kidneys exchanged includes kidneys exchanged together with non-renal organs.

National Balance Points¹⁸:

1. donor age 0-15 = (highest import balance donor age 0-15 – recipient country balance donor age 0-15) x 30
2. donor age 16-49 = (highest import balance donor age 16-49 – recipient country balance donor age 16-49) x 30

¹⁶ P-KAC06.17- Donor categories and balance calculation; Board approval Oct. 2018

¹⁷ Belgium and Luxemburg are considered as one country

¹⁸ P-KAC07.19 - Balance calculation, Implemented January 28, 2020

3. donor age 50-64 = (highest import balance donor age 50-64 – recipient country balance donor age 50-64) x 30

4.10.4.1 Deviant rules; Austria Regional Kidney Exchange Balance

In addition to the National Kidney Exchange Balance, the difference between the number of kidneys procured and exchanged for transplantation between each Austrian center/region and all other (including Austrian) ET centers/regions over the preceding 365 days is calculated once every day.

In case of an Austrian donor, patients from the Austrian centers/regions receive additional balance points according to the following formula:

$$\text{Regional Balance Points}^{19} = 0.25x (\text{Austrian National Balance} - \text{Regional Balance})$$

4.10.5 Kidney after other organ transplant (KAOO)– detailed information

4.10.5.1 Germany²⁰

Patients are eligible for a KAOO bonus in case the patient have chronic dialysis that starts before the other transplant and is ongoing after the other organ is transplanted. Patients did not have to be on the waiting list before the other organ is transplanted. The KAOO bonus is not valid after transplantation of a pancreas.

If the patient fulfils the criteria, 500 bonus points are automatically given as of 90 days after the other organ transplantation until the first kidney transplantation.

4.10.5.2 Other countries²¹

For other countries the patient will automatically receive the bonus points if one of the following criteria is met:

1. The patient is listed on the kidney waiting list before other transplant and dialysis is required after the other organ transplant between 90-360 days,
2. The patient was not listed on the kidney waiting list before other transplant
 - a. dialysis was required at least 6 weeks before other transplant
 - b. dialysis is required after the other organ transplant between 90-360 days.

If the patient fulfills the criteria, 500 bonus points are automatically given as of 90 days after the other organ transplantation until the first kidney transplantation

If the patient did not automatic receive the bonus points and the transplant center is of the opinion the patient fulfills the criteria an audit on the case can be requested.

¹⁹ Please note the Regional Balance Points can be negative, which means a deduction of the total point score

²⁰ Richtlinie gemäß § 16 Abs. 1 S. 1 Nrn. 2 u. 5 TPG für die Wartelistenführung und die Organvermittlung zur Nierentransplantation. Published by the Bundesärztekammer (www.baek.de).

²¹ R-KAC03.16 - KAOO bonus, implemented March 16, 2021

Tables

4.11.1 Conversion of *split* HLA-antigen to *broad* HLA-antigen

Conversion of <i>split</i> HLA-antigen to <i>broad</i> HLA-antigen, as used in the HLA broad match phenotype reduction program									
A23	A9	B51	B5	DR15	DR2	Cw9	Cw3	DQ5	DQ1
A24		B52		DR16		Cw10		DQ6	
A25	A10	B44	B12	DR17	DR3			DQ7	DQ3
A26		B45		DR18				DQ8	
A34		B64	B14	DR11	DR5			DQ9	
A66	B65	DR12							
A29	A19	B62	B15	DR13	DR6				
A30		B63		DR14					
A31		B75							
A32		B76							
A33		B77							
A74		B38	B16						
A68	A28	B39							
A69		B57	B17						
		B58							
		B49	B21						
		B50							
		B54	B22						
		B55							
		B56							
		B60	B40						
		B61							
		B71	B70						
		B72							

4.11.2 HLA antigen frequency

HLA gen frequencies 2014 excl. HLA-A -B splits

HLA-A	2014	HLA-B	2014	HLA-DR	2014
A1	0,1534	B5	0,0738	DR1	0,1151
A2	0,3007	B7	0,1227	DR2	0,1645
A3	0,1490	B8	0,1025	DR15	0,1277
A9	0,1138	B12	0,1217	DR16	0,0368
A10	0,0642	B13	0,0322	DR3	0,1114
A11	0,0555	B14	0,0236	DR17	0,1112
A19	0,1195	B15	0,0758	DR18	0,0002
A28	0,0441	B70	0,0023	DR4	0,1328
A36	0,0001	B16	0,0454	DR5	0,1463
A43	0,0001	B17	0,0453	DR11	0,1261
A203	0,0001	B18	0,0540	DR12	0,0202
A210	0,0001	B21	0,0232	DR6	0,1639
A80	0,0001	B22	0,0252	DR13	0,1314
		B27	0,0483	DR14	0,0325
		B35	0,1027	DR7	0,1164
		B37	0,0140	DR8	0,0312
		B40	0,0684	DR9	0,0087
		B41	0,0111	DR10	0,0096
		B42	0,0004		
		B46	0,0002		
		B47	0,0034		
		B48	0,0008		
		B53	0,0027		
		B59	0,0001		
		B67	0,0002		
		B73	0,0002		
		B703	0,0001		
		B78	0,0002		
		B81	0,0001		
		B2708	0,0001		
		B82	0,0001		
		B83	0,0001		

4.11.3 German ESP (sub) regions

Coordination region	ESP sub region	Transplant centers	ET center code
GBWOR	OZ Stuttgart	Heidelberg Mannheim Stuttgart Tübingen	GHBTTP GMATP GSTTP GTUTP
	OS Freiburg	Freiburg	GFRTTP
GBYOR	OZ München	Augsburg München, Rechts der Isar München, Grosshadern Regensburg	GAUTP GMHTP GMLTP GRBTTP
	OS Erlangen	Nürnberg Würzburg	GNBTTP GWZTP
GMIOR	OZ Mainz	Frankfurt am Main Mainz	GFMTTP GMZTP
	OS Homburg	Homburg-Saar Kaiserslautern	GHSTTP GKSTTP
	OS Marburg	Fulda Giessen Marburg	GFDTTP GGITP GMRTTP
GNDOR	OZ Hannover	Bremen Hannover Hannoversch-Münden	GBMTTP GHOTTP GHMTTP
	OS Hamburg	Hamburg Kiel Lübeck	GHGTTP GKITP GLUTP
GNOOR	OZ Berlin	Berlin, UK B.-Franklin Berlin, Charité	GBETTP GBCTTP
	OS Rostock	Rostock	GROTP
GNWOR	OZ Düsseldorf	Bochum Düsseldorf Essen	GBBTTP GDUTP GESTTP
	OS Köln-Bonn	Aachen Bonn Köln, Lindenthal Köln, Merheim	GAKTTP GBOTTP GKLTP GKMTP
	OS Münster	Münster	GMNTTP
GOSOR	OZ Leipzig	Dresden Halle Jena Leipzig	GDRTP GHATTP GJETTP GLPTTP

4.11 Forms

All forms can be found and downloaded from the section 'Forms' of the Library of the member site at www.eurotransplant.org.

4.12 Pending recommendations

Number	Description	Board approval	Status
R-KAC03.14	Interruption of dialysis	Jan 2015	Declined in Germany, will be implemented in the countries that accepted the recommendation
R-KAC04.16	Regulation for transplantation after a positive cross match result	Jan 2016	Declined in Germany, will be implemented in the countries that accepted the recommendation
P-KAC02.18	Decision time in the EA of kidneys	Oct. 2018	Implemented Non-German countries, Pending authorization Germany
R-KAC01.20	Mandatory recipient items	Nov. 2020	Declined in Germany, will be planned for implementation in all countries but no mandatory registration in Germany
R-KAC02.20	Compensation via audit procedure in special cases	Nov. 2020	Declined in Germany
R-KAC05.20	Exclusion of AM and immunized patients from EA and rescue allocation	Nov. 2020	Approval pending: Germany
R-KAC01.21	Pediatric waiting list registration and bonus points (non-Germany)	May 2021	Will be planned for implementation in all non-German countries
R-KAC02.21	Balancing on donor type	Oct. 2021	Wait for policy on start balance, thereafter planning for implementation
R-KAC03.21	Pediatric donor age	Oct. 2021	Approval pending: Germany