

Chapter 4

Kidney

(ETKAS and ESP)

Change record

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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

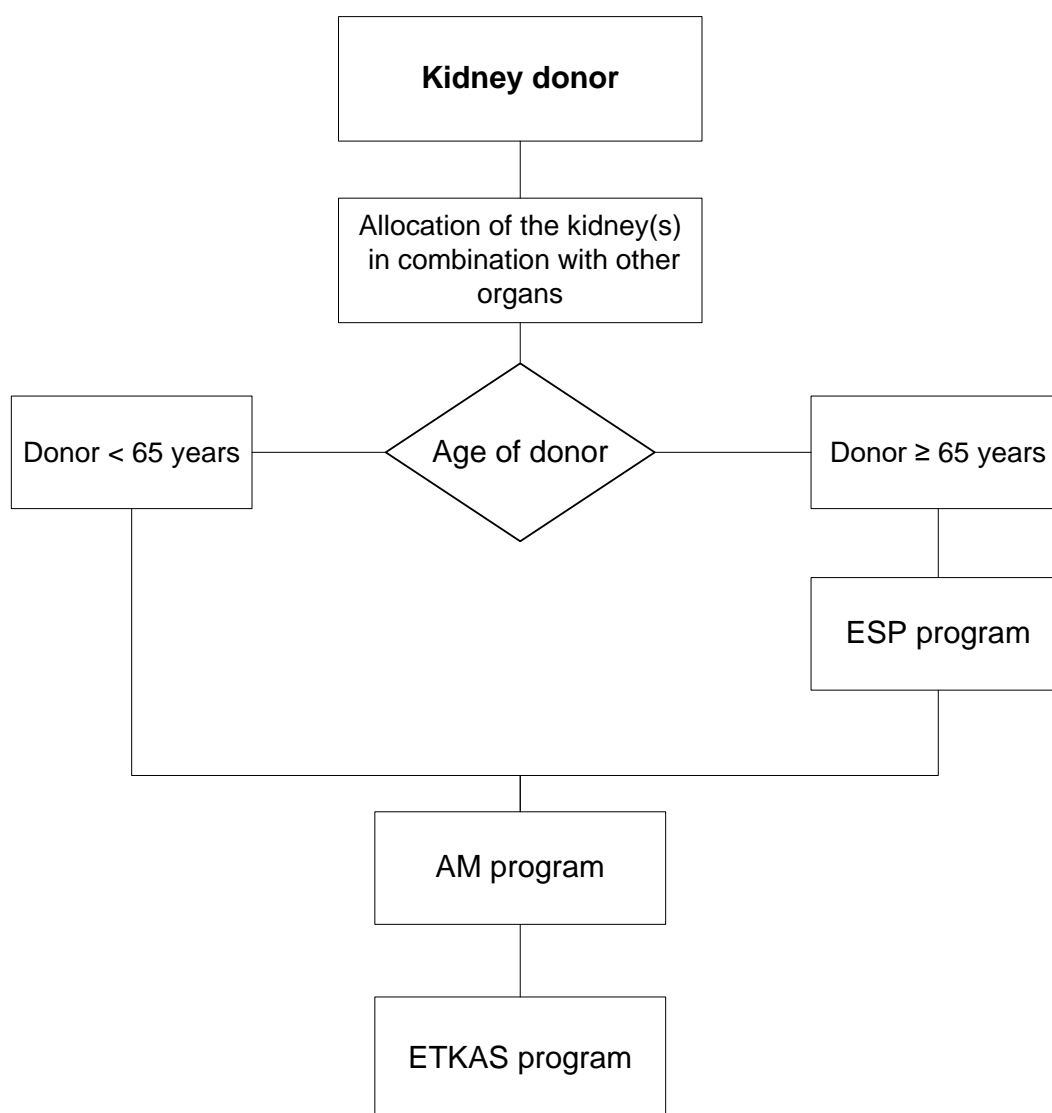
This chapter contains information concerning the allocation of kidneys within Eurotransplant (ET). First, a flowchart of the general kidney allocation is presented. Additionally, kidney allocation related definitions are explained. In the following paragraphs, more information about the urgency codes, 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-sensitization in ENIS (see Table 1).

Urgency codes used in Kidney allocation						
Urgency code		Transplantability	Medical urgency	allo-sensitization (%PRA)		
HU	High Urgency	yes	urgent	0-100		
T	Transplantable	yes	normal	no	%PRA	<6
I	Immunized	yes	normal	yes	%PRA	≥6 and <85
HI	Highly Immunized	yes	normal	yes	%PRA	≥85
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 criteria

- Imminent lack of access for either hemodialysis or peritoneal dialysis.
- Inability to cope with dialysis with a high risk for suicide.
- 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 Non-German countries; additional HU inclusion criterion.

- Severe (uremic) polyneuropathy

4.2.1.3 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 has to 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](#).

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 post mortem donors are not allowed.

4.3.1.1 AM program

Donor blood group	Eligible patients
A	A and AB
B	B and AB
AB	AB
O	A, B, AB 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 cardiocirculatory death (DCD) kidneys

4.3.2.1 DCD type II¹

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)

¹ 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.

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, %PRA level, HLA-A, -B, -DR matching between donor and patient, waiting time and donor region.

Selected potential patients are ranked according to 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, the match is there generated after reporting of the HLA). The patients are selected locally, regionally or national and ranked based on urgency 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 taken into account.

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

4.3.5.1 No allocation via ESP possible

Kidneys from an ESP donor that are not medically declined to start EA and cannot be

allocated locally or regionally will be allocated through the regular kidney allocation (ETKAS) after reporting of the HLA typing.

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 (AM+) 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.

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 donors²

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 donors ≤ 5 years of age³. 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.

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.⁴

² P-KAC05.19 – Logistic reason to start rescue of kidneys from ESP donors; board approval, May 2019

³ P-KAC01.17 – Allocation of kidneys of donors ≤ 5 years of age; board approval, Oct. 2017

⁴ P-KAC02.18 – Decision time in the recipient-oriented rescue allocation (EA) of kidneys, Jan 2019

4.3.12 Prospective cross-match

4.3.12.1 Prospective preliminary cross-match

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

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

4.3.12.2 No serum available for preliminary cross-match

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.

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:

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

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, taking into account ABO blood group rules and PRA screening. 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 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

The following patients qualify for waiting time return:

1. Patients with kidney failure within 90 days after transplantation (all countries).
2. Patients with kidney failure within 1 year after transplantation (non German countries).
3. Patients with kidney failure after transplantation of a kidney of a living donor (non German countries).

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

4.4.5 Pediatric bonus

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 10

-Regional Balance Points⁵ = 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 criteria is not taken into account when the patient has the HU status.

4.4.9 Kidney after liver transplant

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

Patients fulfilling the criteria will receive 500 bonus points.

Criteria, see [Kidney after liver transplant – detailed information](#).

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.

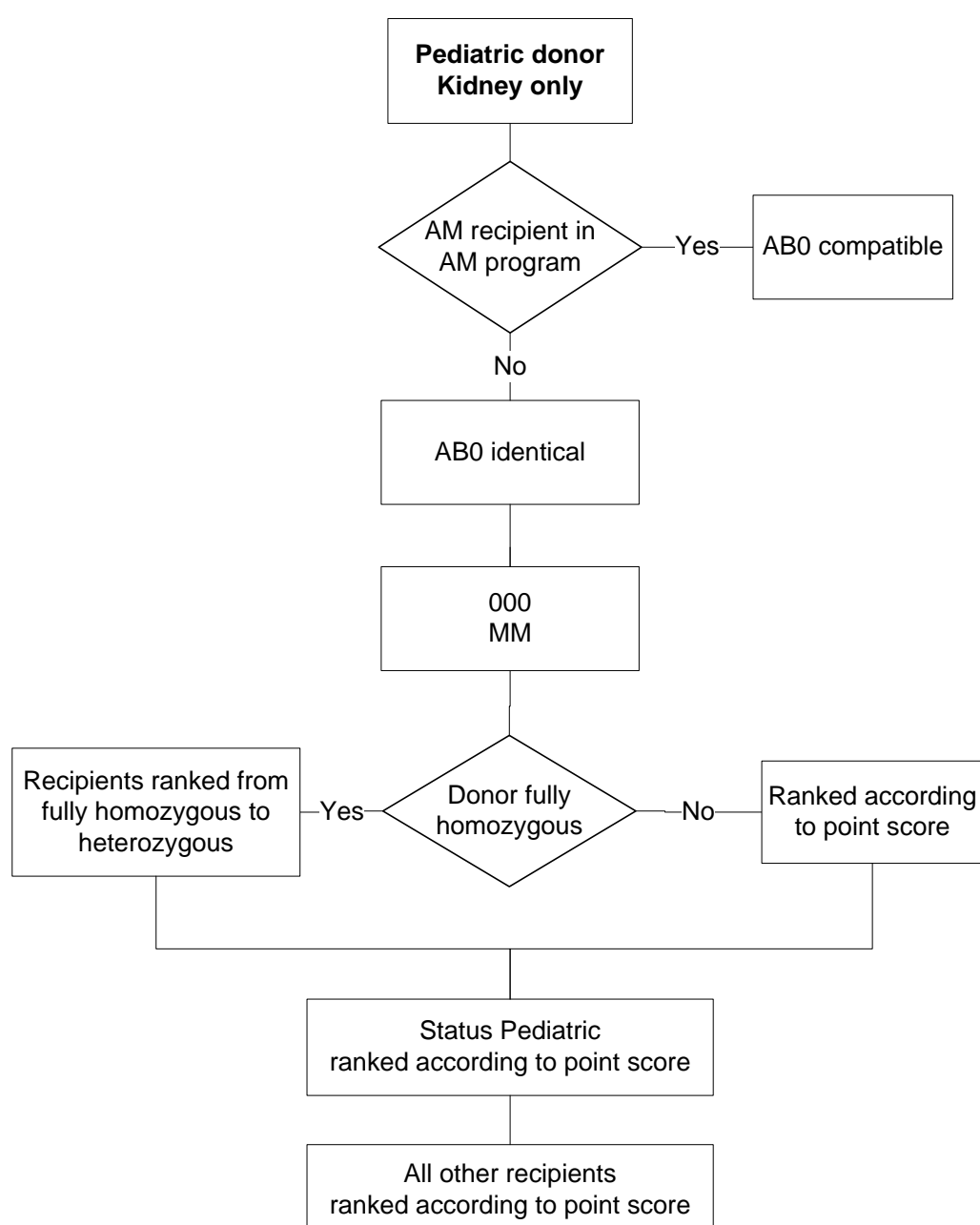
⁵ Please note the Regional Balance Points can be negative, which means a deduction of the total pointscore

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

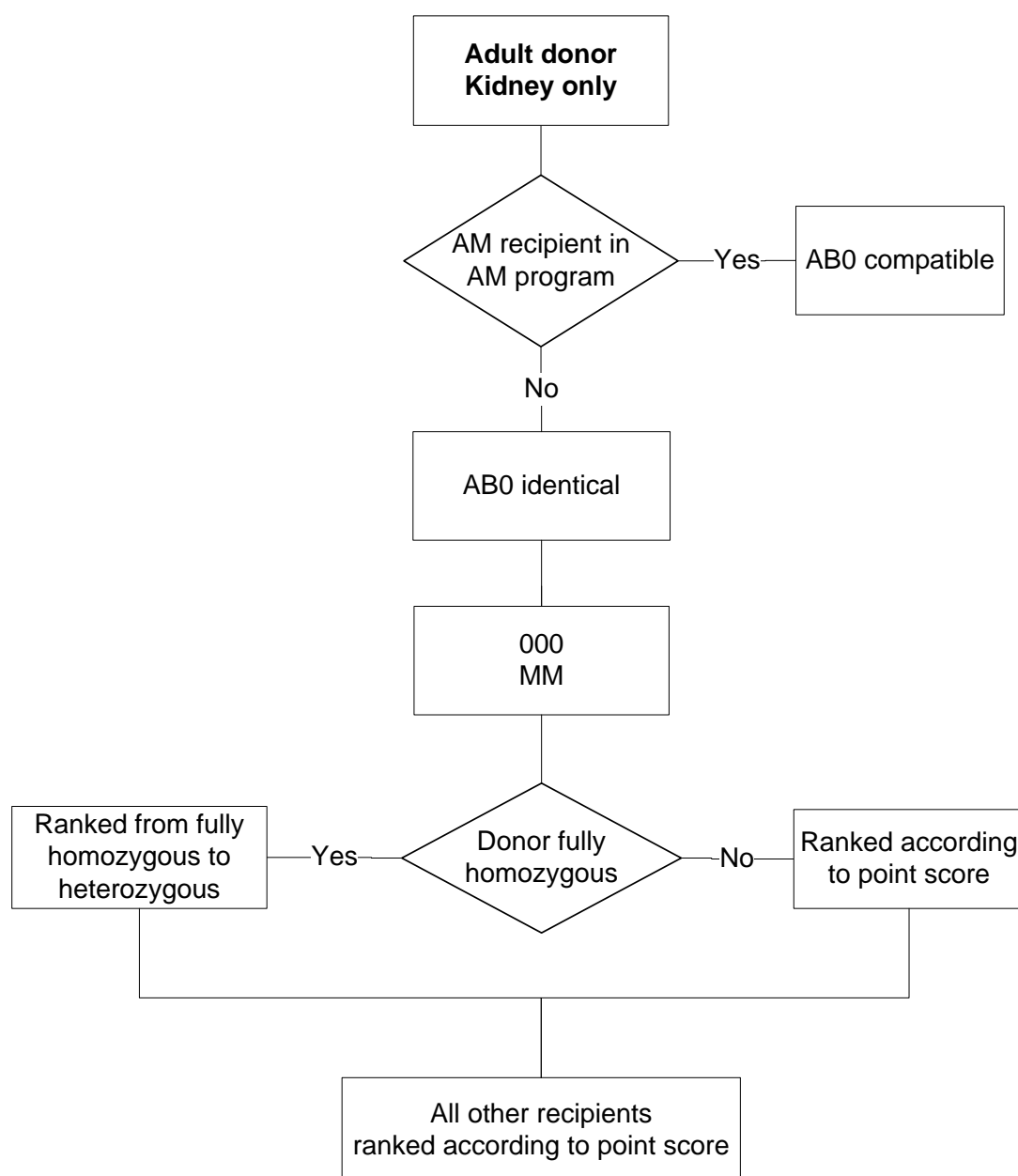
4.5.2 Flowchart 1 – Donor < 16 years



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 HI, 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 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 all other regions

The Netherlands Croatia and Slovenia

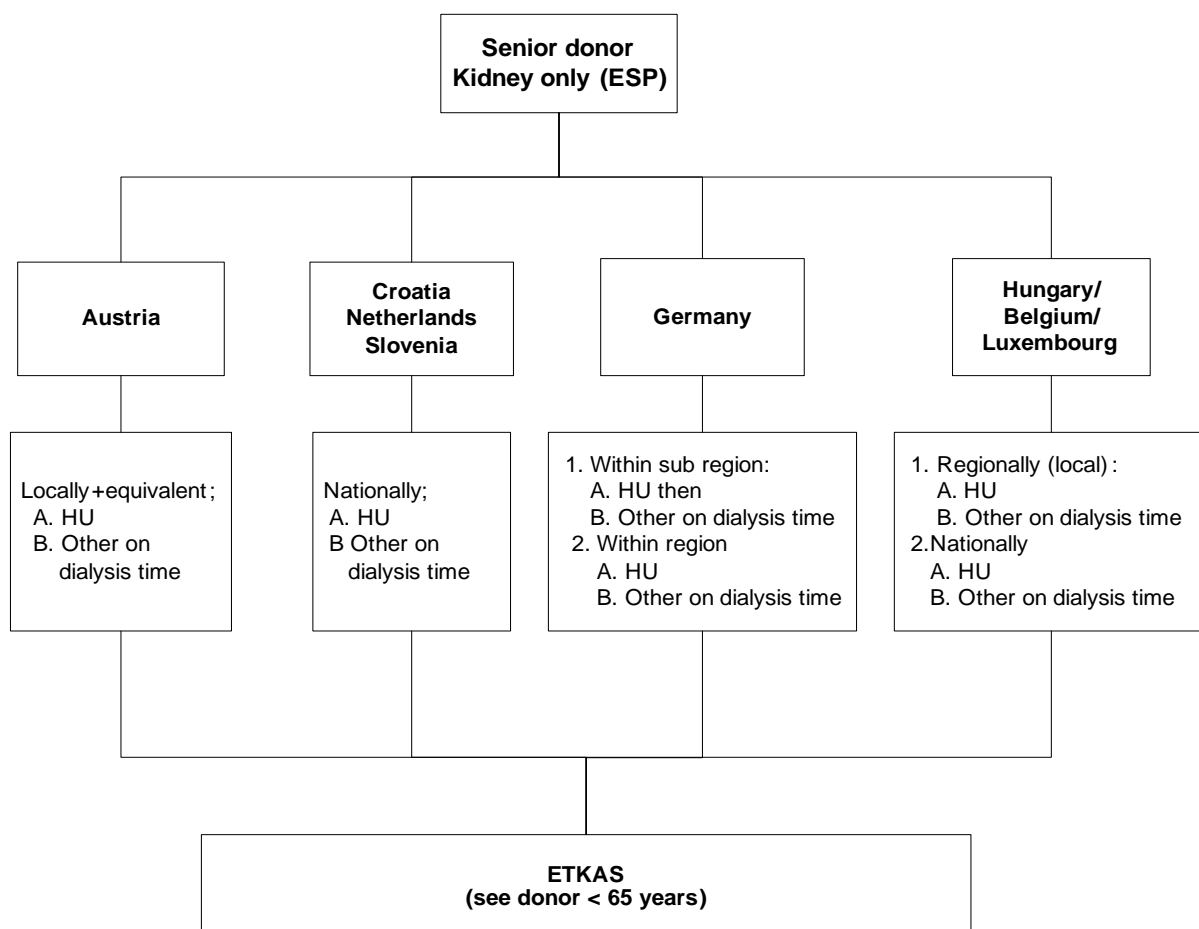
→ Nationally

Belgium/Luxembourg

→ Local center of the donor before all other centers

then, according to the ETKAS scheme (if not medically declined, see Paragraph [ETKAS – allocation algorithms](#))

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 Panel Reactive Allo-antibodies (PRA)

PRA is a percentage which represents the proportion of the population to which the person will react via pre-existing antibodies against HLA.

4.7.1.3 Fully homozygous

Inheritance of two identical HLA antigens at each polymorphic locus.

4.7.1.4 Fully heterozygous

Inheritance of two different HLA antigens at each polymorphic locus.

4.7.1.5 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

4.7.1.6 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 -

4.7.1.7 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

4.7.1.8 Outdated screening

Outdated screenings are those samples that are older than 180 days at time of matching. Patients with outdated screening are not selected in matching procedures.

4.7.1.9 Local(ly)

Patients from the same center as the donor center.

4.7.1.10 Equivalent-local(ly)

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

4.7.1.11 Regional(Iy)

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)).

4.7.1.12 National(Iy)

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

4.7.1.13 International

All transplant programs outside the country of the donor center.

4.7.1.14 Export

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

4.7.1.15 Import

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

4.7.1.16 Transplantable (T)

Elective patients who are transplantable and have a PRA of <6%.

4.7.1.17 High Urgency (HU) patients

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

4.7.1.18 Highly Immunized (HI) patients

Patients who are transplantable and have a PRA of $\geq 85\%$.

4.7.1.19 Immunized (I) patients

Patients who are transplantable and have a PRA range of 6% - 85%.

4.7.1.20 Not Transplantable (NT) patients

Patients temporarily not transplantable should be placed in urgency NT.

4.7.1.21 Removed (Urgency R)

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

4.7.1.22 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 taken into account 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 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.

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 send. 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 has to 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 discussed in the next ETKAC meeting for the final decision.

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.
- The ETKAS-match list; The judgment of the ETRL immunologist is not binding. If the judgment is negative, then this will be communicated to the patients center and the decision to accept or decline the offer will be left to the responsible transplant physician.

4.9.3 ESP - donors ≥ 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, 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 Netherlands, 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 of the donor is known. In Hungary, 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 PRA screening. 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 PRA screening

The %PRA 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 %PRA screening dates, additional %PRA screenings should be performed according to the ETRL guidelines.

A higher %PRA 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

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

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

$$\text{MMP1} = \text{MMP0} \times$$

$$\begin{aligned} & (((2 \times (a1+a2) \times (1 - a1 - a2)) - a1^2 - a2^2 + \Sigma (\text{all HLA-A Ag frequencies}^2)) / ((a1+a2)^2)) + \\ & (((2 \times (b1+b2) \times (1 - b1 - b2)) - b1^2 - b2^2 + \Sigma (\text{all HLA-B Ag frequencies}^2)) / ((b1+b2)^2)) + (((2 \times (dr1+dr2) \times (1 - \\ & dr1 - dr2)) - dr1^2 - dr2^2 + \Sigma (\text{all HLA-DR Ag frequencies}^2)) / ((dr1+dr2)^2)) \end{aligned}$$

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 All countries

When a recipient is re-registered for a kidney transplant with one or more (immediate) previous kidney transplantations having failed, requiring maintenance dialysis within 90 days after the transplantation, the recipient is eligible for the return of waiting time.

This return of waiting time will automatically be calculated.

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

- Start of dialysis and **no** previous transplant, *or*
- Re-institution of dialysis after the last successful transplant, i.e. graft function <90 days.

4.10.2.2 Non-German countries

4.10.2.2.1 Dialysis dependency within 1 year after transplantation⁶

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.

1. 100 % waiting time return if maintenance of dialysis starts 0 to 90 days after the kidney transplant;
2. 75 % waiting time return if maintenance of dialysis starts 91 to 180 days after the kidney transplant;
3. 50 % waiting time return if maintenance of dialysis starts 181 to 270 days after the kidney transplant
4. 25 % waiting time return if maintenance of dialysis starts 271 to 1 year after the

⁶ R-KAC01.14 Return of waiting time; Board approval Sept. 2014

kidney transplant.

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

4.10.2.2.2 Dialysis dependency after transplantation of a kidney from living donor

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 waiting time.

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

- Start of dialysis and **no** previous transplant, *or*
- Re-institution of dialysis after the last successful transplant, i.e. graft function <90 days.

The return of waiting time is done manually on a three month basis, or earlier on request of the transplant center

4.10.3 Pediatric bonus - Delivering and auditing proof of maturation

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 calculation⁷

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

1. Donor age 0-15 years;

⁷ P-KAC06.17- Donor categories and balance calculation; Board approval Oct. 2018

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 country⁸ 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 Points:

1. donor age 0-15 = (highest import balance donor age 0-15 – recipient country balance donor age 0-15) x 10
2. donor age 16-49 = (highest import balance donor age 16-49 – recipient country balance donor age 16-49) x 10
3. donor age 50-64 = (highest import balance donor age 50-64 – recipient country balance donor age 50-64) x 10
4. donor age ≥ 65 = (highest import balance donor age ≥ 65 – recipient country balance donor age ≥ 65) x 10

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:

Regional Balance Points⁹ = $0.25 \times (\text{Austrian National Balance} - \text{Regional Balance})$

4.10.5 Kidney after liver transplant – detailed information

In addition to the option of performing a simultaneous liver-kidney transplant the option of transplanting first the liver and the kidney at a later time is possible in selected cases (i.e. a kidney-after-liver transplant). In particular, this option is preferred in patients with hepato-renal syndrome.

In case of a kidney-after-liver transplant, the patient gets 500 extra points in the kidney allocation system (ETKAS) during the period of 90 to 360 days after the liver-only transplant, provided that:

1. The patient was registered (active or NT) on the kidney waiting list at time of the liver transplant.
2. The creatinin clearance is $< 15 \text{ ml/min}$ (sample date between 87 and 360 days after the liver transplant).

This bonus will be automatically rewarded if the patient is entered in a transplantable status and the above conditions are met and entered. The bonus (i.e. 500 points) expires either at time of the kidney transplant or at the end of the bonus period (i.e.

⁸ Belgium and Luxemburg are considered as one country

⁹ Please note the Regional Balance Points can be negative, which means a deduction of the total point score

360 days after the liver transplant).

4.11 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	A28	B38	B16						
A68		B39							
A69		B57	B17						
		B58							
		B49	B21						
		B50							
		B54	B22						
		B55							
		B56	B40						
		B60							
		B61	B70						
		B71							
		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	GHBTP GMATP GSTTP GTUTP
	OS Freiburg	Freiburg	GFRTTP
GBYOR	OZ München	Augsburg München, Rechts der Isar München, Grosshadern Regensburg	GAUTP GMHTP GMLTP GRBTP
	OS Erlangen	Nürnberg Würzburg	GNBTP GWZTP
GMIOR	OZ Mainz	Frankfurt am Main Mainz	GFMTTP GMZTP
	OS Homburg	Homburg-Saar Kaiserslautern	GHSTP GKSTP
	OS Marburg	Fulda Giessen Marburg	GFDTP GGITP GMRTP
GNDOR	OZ Hannover	Bremen Hannover Hannoversch-Münden	GBMTTP GHOTTP GHMTTP
	OS Hamburg	Hamburg Kiel Lübeck	GHGTP GKITP GLUTP
GNOOR	OZ Berlin	Berlin, UK B.-Franklin Berlin, Charité	GBETTP GBCTTP
	OS Rostock	Rostock	GROTP
GNWOR	OZ Düsseldorf	Bochum Düsseldorf Essen	GBBTP GDUTP GESTP
	OS Köln-Bonn	Aachen Bonn Köln, Lindenthal Köln, Merheim	GAKTP GBOTTP GKLTP GKMTP
	OS Münster	Münster	GMNTP
GOSOR	OZ Leipzig	Dresden Halle Jena Leipzig	GDRTP GHATP GJETP GLPTP

4.12 Forms

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

4.13 Pending recommendations

Number	Description	Date approval board	Status
R-KAC03.10	Waiting time return after living transplantation	May 2010	Implemented Non-German countries, pending authorization Germany
R-KAC01.12	500 bonus points for kidney failure after living kidney donation	May 2012	Implemented Non-German countries, pending authorization Germany
R-KAC02.14	Allocation of kidneys from donors >65 years	Sept. 2014	Pending authorization Germany
R-KAC03.14	Interruption of dialysis	Jan 2015	Declined in Germany, will be implemented in the countries that accepted the recommendation
R-KAC01.16	Prioritization for KALT patients on the ESP match list	Jan 2016	Pending authorization Germany
R-KAC03.16	Kidney-after-other organ transplantation (KAOO) bonus	Sept. 2016	Pending authorization Germany
R-KAC04.16	Regulation for transplantation after a positive cross match result	Jan 2016	Pending authorization Germany
R-KAC02.17	Blood group rules in kidney allocation	Oct. 2017	Pending authorization in more than 1 country
R-KAC03.17	Return waiting time	Oct. 2017	Pending authorization in more than 1 country
R-KAC04.17	Pediatric waiting list registration	Oct. 2017	Implemented excl. the change of audit procedure on maturation and max age for pediatric status Pending authorization in more than 1 country
P-KAC02.18	Decision time in the EA of kidneys	Oct. 2018	Pending authorization Germany
R-KAC01.19	Indications for High Urgent kidney transplantation	Jan. 2019	Pending authorization in more than 1 country
R-KAC02.19	Mandatory recipient items	Jan. 2019	Pending authorization in more than 1 country
R-KAC03.19	Exclusion of AM and immunized patients from EA and rescue allocation	May 2019	Pending authorization in more than 1 country
P-KAC06.19	Allocation of kidneys of HIV positive donors	May 2019	wait for other organs to react on the recommendation