Chapter 6

ET Thoracic Allocation System (EThAS)

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 recipients 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.

Chapter 6 – EThAS

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6.1.1. Overview Urgency Statuses

6.1.1.1. Urgency codes for heart transplant candidates

Urgency statuses are used to classify transplant candidates on the waiting list and to prioritize patients in the thoracic organ match and allocation procedure. The urgency statuses reflect transplantability and medical urgency.

6.1.1.2. Overview table of urgency statuses heart

Heart urgency codes in EThAS			
Urgency code		**Transplantable**	**Medical Urgency**
HU (national / international)	High Urgent	Yes	High Urgent
	High Urgent 1A (only the Netherlands)	Yes	High Urgent
	High Urgent 1B (only the Netherlands)	Yes	High Urgent
ACO	Approved Combined Organ	Yes	More priority in the match
T	Transplantable	Yes	Normal
NT	Not Transplantable	No	n.a*

* n.a. = not applicable

6.1.1.3. High Urgency Status: national vs. international

There are two HU statuses, respectively the national HU status and the international HU status.

The need for an upgrade of the medical urgency status is assessed by the treating physician.

The national HU status is granted according to national policies. These policies are different for each Eurotransplant member state, while in Germany no national HU status is defined.

The international HU status is assigned by an independent team of auditors, where their decision is guided by well defined criteria (see HU Inclusion Criteria, section 6.1.2.2. All heart transplant centers within the Eurotransplant consortium can send in a request for the international HU status 24/7.

6.1.1.3.1. Deviant national/international regulations

6.1.1.3.1.1. The Netherlands, national HU

High urgent heart transplant candidates listed in the Netherlands can be classified, according to their disease severity into status 1A or 1B.

1. Status 1A

- unstable patient dependent on high dose inotropes and/or IABP with restored organ function;
- patient on medium or long-term VAD and restored organ function in whom support is no longer feasible;
- patient listed for an acute re-transplantation due to graft failure <7 days after a previous heart transplant;
- Patient with intractable, life-threatening arrhythmia.

2. Status 1B

- Stabilized patient still on high-dose of inotropes.

6.1.1.3.1.2. Germany, national HU status

Germany has no national HU status. All first requests for an HU status for patients listed in Germany are always submitted to the team of auditors.

6.1.1.4. Approved Combined Organs (ACO)

For patients in need of a multi-organ transplant - except the combination heart with kidney, and heart/ lung with kidney – the ACO status can be requested.

6.1.1.4.1. Applying for the ACO status

A complete documentation and appropriate justification in English of the request for ACO status must be sent to the Eurotransplant duty desk by use of the ACO forms (website → membersite → library →forms).This request is then forwarded to a member of the ET thoracic committee and, depending on the other organ(s), a member of the ET pancreas committee, or a member of the ET liver & intestine committee. The organ committee members who judge upon the ACO request are national representatives of countries different from the requesting country. The organ committee members will be given 24 hours to reach a decision. If no consensus is reached, a third organ committee member will decide on the ACO request. Upon granting of the ACO status, Eurotransplant duty officers will adapt the status accordingly.

6.1.1.5. Transplantable (T)

The urgency status Transplantable (T) is used for elective transplant candidates who are not eligible for the urgency statuses HU or ACO. Time spent in the T status is not limited.

6.1.1.6. Not Transplantable (NT)

Transplant candidates who are temporarily not transplantable should be placed in the urgency status NT. This adaptation of the urgency status is to be done in ENIS by the transplant center. Days spent in NT status, irrespective the previous urgency statuses are not taken into account in the calculation of the waiting time. Requesting an HU status is not possible if the patient is in a NT status.

6.1.1.6.1. Deviant Regulations

6.1.1.6.1.1. Germany

Elective transplant candidates, i.e. T status patients who are temporarily not transplantable can retain up to 30 days of NT waiting time. In the calculation of the waiting time up to a maximum of 30 days in NT status will be added to the T waiting time (see also 6.1.1.6.1.2. and 6.1.5.1.4).

6.1.1.6.2. Return of HU waiting time after NT status

A transplant candidate with HU status, who is subsequently downgraded to T or NT status, but thereafter re-listed with an HU status within a time span of maximum 28 days, will not lose the previously accumulated HU waiting time

Pediatric transplant candidates who are registered as NT are automatically upgraded to the international HU status at the end of their NT period. The previously accumulated HU waiting time is re-assigned to the pediatric transplant but only if this NT period has not exceeded 28 days.

6.1.1.6.2.1. Reporting of the NT status

In order achieve a maximum efficiency of the allocation process all changes from active urgency statuses to NT status should immediately be recorded in ENIS. It is the responsibility of the transplant center to place the patient in the correct urgency status if the patient's condition improves or further deteriorates. Furthermore, if the patient's condition worsens beyond transplantability, the transplant center should remove the patient from the waiting list.

6.1.1.7. Pediatric transplant candidates

A pediatric transplant candidate is a patient under the age of 16 years or proven to be still in a growing phase or still in maturation. These patients receive a pediatric status. All patients with a pediatric status who are registered on the waiting list in an active urgency status receive the international HU status. When a patient reaches the age of 16 years and this patient does not have a proof of still being in maturation, the patient immediately looses the pediatric status, If in addition no request for an HU status had been approved, this patient also looses the international HU status.

6.1.1.7.1. Proof of in maturation

Proof of in maturation has to be delivered by the transplant center. This proof is made of by a report from a radiologist or a pediatric endocrinologist on an X-ray of the left hand, but should not be older than 3 months. The pediatric status which is then granted is for 1 year.
To request and submit this proof of in maturation Status, see also section 6.1.3.2.

6.1.1.7.2. Hospitalized status

All patients with a pediatric status receive the HU International Status. In order to further differentiate between these candidates, patients with a pediatric status who are hospitalized have priority over adult HU patients; while the pediatric status patients who are not hospitalized are sorted among the adult HU patients by HU waiting time.
If a patient with a pediatric status has been admitted to a hospital, the Hospitalized Status can be set to Yes. See ENIS manual for more details.

As soon as the recipient is no longer residing in a hospital, the status should be corrected.

6.1.2. Applying for the HU status

6.1.2.1. Procedure: Applying for national and international HU status

Notification of the national HU status is done by the transplant center in the ENIS system (see ENIS manual).

A request for the international HU status is done by submitting a request to Eurotransplant via the Thoracic Clinical Profile Application (selection option “HU”). A set of mandatory data needs to be sent along with the request (via email) (see Mandatory data, section 6.1.2.4).

All first requests for international HU status are forwarded to the international audit group. If the international HU status is accepted by the international audit group, the international HU status is registered in ENIS by Eurotransplant employees.

The international HU status is granted for a period of 8 weeks, if thereafter this status is considered to be renewed, a re-evaluation of the transplant candidate’ s clinical status should be submitted to Eurotransplant. Similar as with the first request, original data supporting the current status must be sent. All requests for a re-evaluation are judged by the Eurotransplant Medical Staff according to the HU International Criteria (see section 6.1.2.4). If these criteria are not met, the request is then forwarded for evaluation to the international audit group (for further information on the audit team, see Audit Process section 6.1.3).

Note: A transplant center cannot assign an international HU status in ENIS. This status can only be registered in ENIS by Eurotransplant employees.

6.1.2.2. Inclusion Criteria for international HU status

HU patients are patients admitted to an intensive care unit of the transplant center[1] and fulfill all criteria mentioned in a), b) or c)

a) Inotropic therapy:

- Swan Ganz catheter
  - CI < 2.2 l/min/m² AND
  - SVO2 < 55 % AND
  - PC ≥ 10 mmHg

- while on inotropic therapy for at least 48h
  - Dobutamine > 7.5 µg/kg/min or equivalent inotropes OR
  - Milrinone > 0.5 µg/kg/min or equivalent PDE inhibitor

- And signs of beginning secondary organ failure:
  - sodium < 136 mmol/l OR
  - increase of creatinine during clinical course in spite of treatment OR
  - increase of transaminases OR
  - symptomatic of cerebral perfusion deficit (neurological report)

b) Complications while on assist device:

- life threatening assist device complications or failure of an implanted device that can only be treated by assist device exchange OR
- infection of assist device with positive blood cultures or other proof of infection of the device (sole infection of the driveline excluded) OR
- repeated assist-related cerebral events demonstrated with CT scan (without neurological sequel that represent a contraindication to heart transplantation)

c) Additional special cases:

- acute re-transplantation due to primary graft failure within 1 week after transplantation, this is not in itself an indication, see below.

6.1.2.3. Relative contraindications

- Multi-organ failure
- Emergency indication without preceding evaluation after:
  - heart surgery
  - large myocardial infarction
  - fulminant myocarditis

[1] The HU status of a patient requires that the patient is hospitalized in the transplant center or in a hospital cooperating with the transplant center and using the same medical therapy guidelines as the transplant center. This hospital is to be situated at such a distance that a transplant center physician is able to visit the patient at least once a week. The visit is to be documented.

- Acute re-transplantation (except for acute re-transplantation due to primary graft failure within 1 week after transplantation, if implantation of VAD is not possible or has only limited chances for success)
- Complications in the early phase (approx. 1-2 weeks) after implantation of an assist device without prior clinical stabilization of the patient
- Recipient older than 65 years

6.1.2.4. Mandatory data

Mandatory data (copies of original reports sent by email) that are relevant to the request:

- current treatment data
- current Swan-Ganz catheter data (not older than 5 days)
- blood gas analysis (arterial, mixed venous)
- current (day of request or previous day) laboratory values (hemogram, electrolytes, kidney, liver)
- echocardiography
- if applicable: respirator parameters

6.1.3. Audit process

All first requests for the international HU status are forwarded by Eurotransplant to the international HU audit group, who will judge upon the request. In addition, all re-evaluations for an international HU status that do not fulfill the HU International criteria are forwarded to this international HU audit group.

6.1.3.1. International audit group

From each accredited thoracic transplant center in Eurotransplant, 2 experienced transplant physicians can be nominated, by the program director, to become members of the international HU audit group.

The international HU audit group is operational 24/7 and consists of three members that rotate weekly. The audit members on call always include an internist and a surgeon. In case an audit member is not available, a reserve auditor will be consulted.

The final decision (approval or denial) of the request for an international HU status is based on a majority vote.

Auditors have to reply by email as soon as possible (as agreed upon in the payment contracts within 6 hours after receiving the request) after receiving the request. If an auditor needs additional information in order to come to a decision, the center that has submitted the request for an international HU status has to provide the specified information to the auditor as soon as possible.

6.1.3.1.1. Objections

In case a request for the international HU status is denied the requesting center is allowed to file an objection against the auditors decisions, but only if the objection is accompanied with new information or if relevant information regarding the recipient was overlooked. This additional information is forwarded to the auditors who previously denied the request. The objection to the auditors' decision needs to be submitted to Eurotransplant with 24 hours, after the auditors' final decision. In case the objection to the auditor's decision is sent in too late and the transplant center decides to submit a new request for the international HU status, this latter request will be treated as a first request, this implies that in case the international HU status is granted, the HU waiting time counter is reset to zero days.

The transplant center is responsible for the delivery and the accuracy of all the data.

Any deviations from the procedure which could result in incorrect allocation of organs will be reported to the national authorities of the concerning Eurotransplant member state and the chairman of the Thoracic Advisory Committee.

6.1.3.2. Audit process of patients with a pediatric status

Proof of in maturation
If a patient is 16 years or older, but still growing, a center can apply for a Pediatric Status. A proof of in maturation has to be submitted to Eurotransplant, this can already be done before the patient becomes 16 years. This proof of in maturation consists out of a report from a radiologist or pediatric endocrinologist on an X-ray of the left hand, but should not be older than 3 months. This report has to be submitted to Eurotransplant by email (urgency@eurotransplant.org). Thereafter the request is judged by two independent auditors appointed by Eurotransplant. This is a 24/7 process. In the case of a split decision, a third auditor has to be consulted for a final decision. In order to keep the pediatric status, the proof of in maturation has to be updated yearly as long as the recipient is still on the waiting list.
After acceptance Eurotransplant will send a confirmation letter with a re-evaluation date to the requesting center.

Hospitalized status
If a patient with a pediatric status has been admitted to a hospital, the Hospitalized Status can be set to Yes. See ENIS manual for more details.

6.1.4. Duration HU / pediatric status

The national HU status is valid till the patient is transplanted, has died or till the treating physician redraws the status.
The international HU status is valid for a period of 8 weeks.
The pediatric status and subsequent international HU status expires the day after the patient's 16th birthday, unless is has been proven that the patient is

still growing (proof of in maturation) or the patient has been transplanted. This proof of in maturation is valid for a period of one year.

6.1.5. Allocation factors

For exact ranking see the Allocation Algorithms, section 6.4.

6.1.5.1. Rank Tier system

The ranking of transplant candidates is based on several characteristics. These characteristics include the following patient factors: the medical urgency status, the pediatric status, the resident status (only in Belgium), degree of immunization (only in Germany). Furthermore the donor-to-recipient AB0 blood group relations as well as the donor-to-recipient country balance are considered.

6.1.5.1.1. Country balance

The balance between the donor and recipient countries is defined as the cumulative difference between the numbers of transplants performed in country X with donor hearts imported from country Y and the number of heart transplants performed in country Y with donor hearts from country X. The balance is calculated as of September 1, 2004.

The total balance takes all heart transplants into account, while the HU balance only counts heart transplants performed in HU transplant candidates.

A negative country balance for country X with country Y is reached if country X exported more hearts to country Y, and which are subsequently used for transplantation, than the number of donor hearts from country Y returned and used for transplantation in country X.

6.1.5.1.2. Medical Urgency status

The different medical urgency statuses that play a role in the allocation procedure are the HU status (both national and international) the pediatric status (both the hospitalized and the not hospitalized status), the ACO, and the T status. Patients who are registered as NT are not selected in the match.

6.1.5.1.2.1. Maximum age donor profile for HU status

If a transplant candidate has the HU status and is older than 50 years of age, the maximum donor age profile is ignored in the offering process. For HU transplant candidates under the age of 50 years, the donor age profile as denoted in ENIS is considered in the organ offering process.

6.1.5.1.2.2. Hospitalized pediatric transplant candidates

Within each tier of HU patients the hospitalized pediatric transplant candidates will have priority over all the other HU recipients.

6.1.5.1.3. Donor information requirements

The following donor characteristics are required in order to generate a heart match:

- donor size (min and max) specified by gender
- donor age (min and max)
- Acceptance of a heart from a donor who is/has:
    - HBsAG pos
    - HBcAb pos
    - HCV pos
    - CMV
    - Sepsis
    - Meningitis
    - Malignant tumor
    - Drug abuse
    - Domino donor

6.1.5.1.4. Waiting time

Waiting time is counted in days with a separate counter for each urgency status. The waiting time for an elective patient is the sum of previously accumulated HU and elective (T) days. The waiting time for an HU patient equals the number of days continuous waiting in this status. If a patient has turned NT for a maximum duration of 28 days then the previously accumulated HU waiting days are added. In the calculation of waiting time for an elective patient, the NT time is not taken into account, except for patients listed in Germany. German transplant candidates can accumulate a maximum of 30 days in the NT status, which are added to the T waiting days.

6.1.5.1.5. Non-resident transplant candidates

Non-resident transplant candidates registered in Belgium are offered a donor heart after all Eurotransplant residents.

6.1.5.2. Additional allocation factors

6.1.5.2.1. AB0 Blood group rules

Four different AB0 blood group schemes are defined. The applications of these schemes vary by country.

AB0 identical

			Recipient		
		A	**AB**	**B**	**0**
Donor	**A**	**x**			
	AB		**x**		
	B			**x**	
	0				**x**

AB0 modified

			Recipient		
		A	**AB**	**B**	**0**
Donor	**A**	**x**	**x**		
	AB		**x**		
	B			**x**	
	0			**x**	**x**

ET AB0 compatible

			Recipient		
		A	**AB**	**B**	**0**
Donor	**A**	**x**	**x**		
	AB		**x**		
	B		**x**	**x**	
	0			**x**	**x**

AB0 compatible

			Recipient		
		A	**AB**	**B**	**0**
Donor	**A**	**x**	**x**		
	AB		**x**		
	B		**x**	**x**	
	0	**x**	**x**	**x**	**x**

6.1.5.2.1.1. AB0-Incompatible heart transplantations

AB0-incompatible heart transplants are only allowed in patients under the age of 2 years provided that:

- A protocol approved by the local ethics committee has been submitted by the transplant center to Eurotransplant;
- Within Eurotransplant there are no suitable AB0 blood group compatible recipients available at the time of the organ allocation.

6.1.5.2.2. Higher ranking heart-lung transplant candidates

Heart-lung transplant candidates are ranked above heart-only transplant candidates within the same urgency tier.

6.1.5.2.3. High immunized transplant candidates

A high immunized transplant candidate is a patient who has a current PRA of at least 50%.

Highly immunized transplant candidates registered in Germany are prioritized in the allocation scheme, but only if the donor is procured in Germany. A cross match is required before transplantation, if no serum available in the donor center, the organ offer will not be made or the offer will be withdrawn.

6.1.5.2.4. 10% Extended donor height profile

In order to avoid the situation that a donor offer is missed because the donor height falls outside the donor height profile and to avoid the situation that transplant centers cope with this issue by extending the donor height profile to unrealistic extremes the 10% donor height rule is introduced in all Eurotransplant member states, except Germany. Donor hearts are only offered to those transplant candidates where the designated donor profile encompasses this specific donor height. According to the 10% rule, transplant candidates are selected whose designated donor profile 10% is extended. The 10% extended donor height profile is calculated as follows: minimum height in the donor profile minus 10% of this minimum value and maximum height in the donor profile plus 10% of this maximum value (see additional example).

For example:
Designated donor height profile range: 1.60 - 1.80m

If the donor height is between 1.60 to 1.80 meters, the recipient appears is the match. If not, the recipient does not appear in the match.

With the 10% extended height profile calculation:
→10% calculation: 10% of 1.60m is 0.16m (16cm)
→10% calculation: 10% of 1.80m is 0.18m (18cm)

So in the case of this recipient's donor profile for height:
1.80m + 0.18m = 1.98m **extended maximum donor height**
1.60m – 0.16 = 1.44m **extended minimum donor height**

→ New donor height profile: 1.44 – 1.98m

In the 10% rule, if the donor has a height between, 1.44 to 1.98 meters then the patient is included in the match, but will be ranked after the elective national transplant candidates.

6.1.5.2.5. Deviant national regulation

6.1.5.2.5.1. Germany

The 10 % donor height profile is not applied for donors from Germany or for candidates listed in Germany.

6.1.5.3. Other

6.1.5.3.1. Domino heart transplantation

If a post-mortem donor heart is transplanted in a patient whose primary disease allows the use of the patient's own heart, the patient's heart can be used for a consecutive, second transplant (domino heart).

The recipient of the first post-mortem heart allografts is then considered a "living donor" for the second consecutive heart transplantation.

A transplant candidate for this domino heart can be selected from the center's own waiting list, except in Germany. In Germany or in other countries where no local candidates are available, the domino heart will be allocated through the standard heart allocation scheme. If a center is willing to accept a domino heart for one of their patients, this should be indicated in the patient's donor profile in ENIS. Patients are selected according to their donor profile if acceptance of a domino donor heart is marked yes, and then the patient will be selected for the match.

6.1.5.3.1.1. Deviant national definitions, Germany

A domino heart is considered a difficult-to-allocate organ and is allocated through ETHAS to those patients who have denoted in the donor profile a willingness to accept this type of donor hearts.

6.2. HEART- LUNG

6.2.1. Overview urgency statuses

6.2.1.1. Urgency codes for heart –lung transplant candidates

Urgency codes are used to classify transplant candidates on the waiting list and to prioritize the patients in the thoracic organ match and allocation procedure. The urgency codes reflect transplantability and medical urgency.

6.2.1.2. Overview table urgency status heart - lung

Heart - Lung urgency codes in EThAS			
Urgency code		**Transplantable**	**Medical Urgency**
HU (national / international)	High Urgency	Yes	High Urgent
ACO	Approved Combined Organ	Yes	More priority in the match.
T	Transplantable	Yes	Normal
NT	Not Transplantable	No	n.a.

* n.a. = not applicable

6.2.1.3. High urgency status: national vs. international

There are two HU statuses, respectively the national HU status and the international HU status.

The need for an upgrade of the medical urgency status is assessed by the treating physician.

The national HU status is granted according to national policies. These policies are different for each Eurotransplant member state, while in Germany no national HU status is defined.

The international HU status is assigned by an independent team of auditors, where their decision is guided by well defined criteria (see section 6.2.2.4) by an international audit group. All heart transplant centers within the Eurotransplant consortium can send in a request for the HU International Status.

6.2.1.3.1. Deviant national / international regulation

6.2.1.3.1.1. Germany, national HU status

Germany has no national HU status. All requests for an HU status for patients listed in Germany are always submitted to the team of auditors.

6.2.1.4. Approved Combined Organs (ACO)

For patients in need of a multi-organ transplant -except for the combination heart- lung and kidney – the ACO status can be requested.

6.2.1.4.1. Applying for the ACO Status

See procedure for HEART 6.1.1.4

6.2.1.5. Transplantable (T)

See procedure for HEART 6.1.1.5.

6.2.1.6. Not Transplantable (NT)

See procedure for HEART 6.1.1.6.

6.2.1.6.1. Deviant Regulations

6.2.1.6.1.1. Germany

See procedure for HEART 6.1.1.6.1.1.

6.2.1.6.2. Return HU waiting time after NT status

See procedure for HEART 6.1.1.6.2.

6.2.1.6.3. Reporting of the NT status

See procedure for HEART 6.1.1.6.3.

6.2.1.7. Pediatric recipients

See procedure for HEART 6.1.1.7.

6.2.1.7.1. Proof of in maturation

See procedure for HEART 6.1.1.7.1.

6.2.1.7.2. Hospitalized status

See procedure for HEART 6.1.1.7.2.

6.2.2. Applying for HU status

6.2.2.1. Procedure: Applying for national and international HU status

See procedure for HEART 6.1.2.

6.2.2.2. High urgency

6.2.2.2.1. Inclusion criteria

Patients should be ventilator dependent or on ECMO (iLA) support. In case the patient further deteriorates despite these interventions, the HU status is no longer indicated.

6.2.3. Audit process

All first requests for the international HU International status are forwarded by Eurotransplant to the international HU audit group, who will judge upon the request.

6.2.3.1. International HU audit group

See procedure for the heart HU audit 6.1.3.1.

6.2.3.1.1. Objections

See procedure for the HEART 6.1.3.1.1.

6.2.3.1.2. Audit process pediatric recipients

6.2.3.1.2.1. Proof of in maturation

See procedure for the HEART 6.1.3.2.

6.2.3.1.2.2. Hospitalized status

See procedure for HEART 6.1.4.

6.2.4. Duration HU/pediatric status

See procedure for the HEART 6.1.5.

6.2.5. Allocation factors

See procedure for the HEART 6.1.5.1.1.

6.2.5.1. Rank Tier System

See procedure for HEART 6.1.5.1.

6.2.5.1.1. Country balance donor country

See procedure for HEART 6.1.5.1.1.

6.2.5.1.2. Medical urgency status

See procedure for HEART 6.1.5.1.2.

6.2.5.1.2.1. Hospitalized pediatric recipients

See procedure for HEART 6.1.5.1.2.2.

6.2.5.1.3. Donor information requirements

The following donor characteristics are required in order to generate a heart-lung match:

- donor total lung capacity (TLC) (min and max)
- donor age (min and max)

- Acceptance of heart-lung from a donor who is/has:
  - HBsAG pos
  - HBcAb pos
  - HCV pos
  - CMV
  - Sepsis
  - Meningitis
  - Malignant tumor
  - Drug abuse
  - Domino donor

6.2.5.1.3.1. Formula for calculating Total Lung Capacity (TLC)[2]

Donor < 120 cm
- Male donor: TLC = 1.37 x [height (m)] ^ 2.5698
- Female donor: TLC = 1.30 x [height (m)] ^ 2.5755

Donor ≥ 120 cm
- Male donor: TLC = 7.99 x [height (m)] – 7.08
- Female donor: TLC = 6.60 x [height (m)] – 5.79

6.2.5.1.4. Waiting time

See procedure for HEART 6.1.5.1.4.

6.2.5.1.5. Non-resident transplant candidates

See procedure for HEART 6.1.5.1.5.

6.2.5.2. Additional allocation factors

6.2.5.2.1. AB0 Blood group rules

See procedure for HEART 6.1.5.2.1.

6.2.5.2.2. Highly immunized recipients Germany

See procedure HEART 6.1.5.2.3.

6.2.5.2.3. 10% Extended donor height and TLC profile

In order to avoid the situation that a donor offer is missed because the donor TLC falls outside the donor profile and to avoid the situation that transplant centers cope with this issue by extending the donor TLC profile to unrealistic extremes, the 10% donor TLC rule is introduced in all Eurotransplant members states, except in Germany. Donor heart-lung blocks are only offered to those transplant candidates where the designated donor profile encompasses this specific donor TLC.
According to the 10% rule transplant candidates are selected whose designated donor profile 10% is extended. The 10% extended TLC donor profile is calculated as follows: minimum TLC in the donor minus 10% of this minimum value and maximum TLC in the donor profile plus 10% of this maximum value.

For example:
Designated donor TLC profile range 5.5 - 6.5 L

If the donor TLC is between 5.5 – 6.5 L, the recipient appears in the match. If not, the recipient does not appear in the match.

[2] Zapletal et al. Standardization of lung function tests in pediatrics. The European Respiratory Journal 1989; 2, Supll 4. Ed. The Working Group Pediatrics SEPCR.

With the 10% extended TLC profile calculation:
→10% calculation: 10% of 5.5 L is 0.55 L
→ 10% calculation: 10% of 6.5 L is 0.65 L

So in the case of this recipient's donor profile for TLC:
6.5 L + 0.65 L = 7.15 L **extended maximum donor TLC**
5.5 L – 0.55 L = 4.95 L **extended minimum donor TLC**

→ New donor TLC range: 4.95 – 7.15L

In the 10% rule, if the donor has a TLC between, 4.95 to 7.16 L then the recipient is included in the match but will be ranked after the elective national transplant candidates.

6.2.5.2.4. Deviant national regulation

6.2.5.2.4.1. Germany

The 10 % donor TLC profile is not applied for German recipients or for donors from Germany.

6.3. Lung

6.3.1. Introduction

6.3.1.1. LAS

LAS is the acronym for the Lung Allocation Score. The LAS value reflects both the disease severity as well as the expected benefit after lung transplantation. and is used for allocation lung allografts such that the patient with the highest LAS value will be the first one to receive the lung offer. The score is constructed from estimates of each candidate's medical urgency prior to transplantation and the probability of success after transplantation. Since the system is based on a 'net benefit' concept it will give priority to candidates who are most urgently in need of a transplant *and* who are expected to receive the greatest benefit.

6.3.1.2. Calculation of LAS

See ET LAS Calculation Guide on the Membersite.

6.3.1.3. To whom does LAS apply?

In case of a lung donor from Germany or the Netherlands, all lung transplant candidates listed in Germany or the Netherlands will be sorted on the lung match list according to LAS.

In case of a lung donor from a country X that has a positive balance with country Y, all patients from country Y will be sorted on the lung match from country X according to LAS.

The lung transplant candidates listed in Austria or Belgium will still be allocated according to the national law in case of a national donor.

6.3.1.4. Pediatric transplant candidates

Children under the age of 12 years, who are registered in Eurotransplant for lung transplant all receive a LAS of 100. It is not necessary to enter a request for these children until their 12th birthday as a LAS value of 100 is generated automatically upon registration on the waiting list.

6.3.2. LAS factors

The following factors are contained in the LAS.

1. Height (cm)
2. Weight (kg)
3. Date of Birth
4. Lung Diagnosis Code
5. Assistance level
6. Diabetes

7. Assisted Ventilation
8. Oxygen requirement
9. Supplemental Oxygen (FlO2 in % or l /min)
10. FVC %predicted
11. Pulmonary Artery Systolic Pressure (mmHg)
12. Mean Pulmonary Artery Pressure (mmHg)
13. Pulmonary Capillary Wedge Mean (mmHg)
14. Current PCO2 (mmHg)
15. Highest PCO2 (mmHg)
16. Lowest PCO2 (mmHg)
17. Six Minute Walk Distance (m)
18. Serum Creatinine (mg/dl)

6.3.3. Items required for LAS

The LAS is calculated based on the values indicated in the overview (section 6.3.2). If certain values are missing a default value is used to calculate the score. Information on height, weight and date of birth is absolute required to add a new candidate to the waiting list. Information on the patient's functional status and assisted ventilation needs to be submitted; otherwise the calculated LAS will be 0.
A calculated LAS which is based on default values will in general be lower compared to the LAS based on measured values.

6.3.3.1. Default values

#	Items LAS calculator	High LAS	Low LAS	Comment/Default Value
1	Height (cm)	Cannot be missing	Cannot be missing	Needed for registration
2	Weight (kg)	Cannot be missing	Cannot be missing	Needed for registration
3	Data of birth	Cannot be missing	Cannot be missing	Needed for registration
4	Lung Diagnosis Code	Cannot be missing	Cannot be missing	**If missing or expired LAS=0**
5	Assistance level (none, some, total)	Maximum 7 days old	Maximum 4 weeks old	**If missing or expired LAS=0**
6	Diabetes (no diabetes, insulin dependent, non insulin dependent, unknown)	At first registration	At first registration	Default: not diabetic
7	Assisted Ventilation (not needed, CPAP,	Maximum 7 days old	Maximum 4 weeks old	**If missing or expired LAS=0**

	BiPAP, continuous invasive, intermittent invasive)			
8	Oxygen requirement (not needed, with exercise only, at night, at rest)	Maximum 7 days old	Maximum 4 weeks old	Default: not required
9	Supplemental Oxygen (FlO2 in % or l /min)	Maximum 7 days old	Maximum 4 weeks old	Default: 0 ECMO*: value before start , but not older than 6 months
10	FVC %predicted	Maximum 7 days old	Maximum 4 weeks old	Default: 150 ECMO* and Ventilated patients: most recent value prior to start. For all other patients for whom a LFT cannot be performed (ICU admission, continuous BiPAP, pneumothorax), the same rule as for ECMO/MV pts may be applied, but in these cases a written and signed statement of the arguments should be submitted.
11	Pulmonary Artery Systolic Pressure (mmHg)	Maximum 1 year old	Maximum 1 year old	This only needs to be measured once, upon initial registration on the waiting list. No repeated measurement is needed. Default: 20
12	Mean Pulmonary Artery Pressure (mmHg)	Maximum 1 year old	Maximum 1 year old	This only needs to be measured once, upon initial registration on the waiting list. Default: 15
13	Pulmonary Capillary Wedge Mean (mmHg)	Maximum 1 year old	Maximum 1 year old	This only needs to be measured once, upon initial registration on the waiting list. Default: 5
14	Current PCO2 (mmHg)	Maximum 7 days old	Maximum 4 weeks old	Artery, capillary Default: 40 ECMO*: value before start treatment
15	Highest PCO2 (mmHg)	Maximum 6 months	Maximum 6 months	Artery, capillary Default: 40 ECMO*: value before start

				treatment
16	Lowest PCO2 (mmHg)	Maximum 6 months	Maximum 6 months	Artery, capillary Default: 40 ECMO*: value before start treatment
17	Increase in PCO2 % from lowest to highest	Calculated by ET	Calculated by ET	Default: 0
18	Six Minute Walk Distance (m)	Maximum 7 days old	Maximum 4 weeks old	Missing Default: 46 If on mechanical ventilation or ECMO* and fill out: 0
19	Serum Creatinine (mg/dl)	Maximum 7 days old	Maximum 4 weeks old	Default: 10
20	Bilirubine (mg/dl) “	Maximum 7 days 9old	Maximum 4 weeks old	Default: 0.7
21	Sp02 (%)”	Maximum 7 days old	Maximum 4 weeks old	Default: 50
22	Estimated RVSP (mmHG)“ (ultrasound)	Maximum 7 days old	Maximum 4 weeks old	Default: 25
23	Coagulopathy ” (Thromb < 50/nl, INR > 2	Maximum 7 days old	Maximum 4 weeks old	Default: No
24	IV prostanoids”	Maximum 7 days old	Maximum 4 weeks old	Default: No
25	Pneumothorax with drainage” (yes , no)	Maximum 7 days old	Maximum 4 weeks old	Default: No
26	Extracorporal support” (no, ILA, ECMO)	Maximum 7 days old	Maximum 4 weeks old	Default: No

“ LAS plus items
*the rule for ECMO patients holds true for ILA and ECLS patients

Following P-ThAC01.14 the following additional rules are to be followed:

- For low LAS patients: screening data can be up to 6 weeks old in order to allow a more flexible time scale in data collection
- For all intubated patients and for patients with a pneumothorax: the data fields FVC, PAPsys, PAPmean and PCWPmean can be used from dated measurements, no matter how old the measurement date.
- For Netherlands: the 6MWT does not need to be repeated

Full text of policy P-ThAC01.14 (enacted as of 9 December 2014)

- LAS data entered for a patient who is first listed for lung transplantation (screening data) can be up to 6 weeks old. Except in the case the calculated LAS

value is ≥ 50, then the validity is 7 days.

- Allow any previous PFT upon request for intubated patients, no matter how old.

- PAH patients on awake ECMO can be accepted with LAS value equivalent to the 99th percentile.

- PAH patients with CI <2 l/m^2 and RA>15 or bilirubin increase by 50%/abnormal or a creatinine increase by >50%/abnormal, can be accepted with LAS value equivalent to the 95th percentile.

- For patients with pneumothorax and a drain, PFT are no contraindication but a reduced FVC is expected. For patients with pneumothorax without drain the last previous PFT are allowed, no matter how old. If no PFT are available, the least beneficial default values are used.

- The 6-MWT should only be entered once, at first listing. (only for the Netherlands)

- Allow short-cut eLAS decision yes/no for exceptional value requests (no formal letter) in those cases where the patient fulfilled the indications for eLAS request, but the initially proposed eLAS value was deemed too high by the review board members.

Full text of policy P-ThAC02.15 (enacted as of November 10, 2015)

- *Blood gases for evaluation by LAS must adhere to all of the following criteria*
  - Blood gases should be of arterial or capillary origin;
  - Blood gases at rest must be entered. Blood gases during or after exercise, or at night are not acceptable;
  - Blood gases should be performed after titration of oxygen flow and adjusted by pulse oximetry to a target oxygen saturation of 90-92%;
  - Blood gases with a pO2 > 100 mmHg (>13.3 KPa) should be repeated with oxygen titration to a target oxygen saturation of 90-92%.
  - The last (in date and time) oxygen saturation measured by pulse oximetry after oxygen titration and the corresponding oxygen flow or fraction after titration should be recorded on the blood gas report.

- *High flow nasal cannula*

High flow (HF)- oxygen therapy (=HF nasal cannula (HFNC)) is defined as an oxygen flow >15L/min;
In patients with HF-oxygen therapy, oxygen saturation (SpO2) should be measured by pulse oximetry continuously including documentation of SpO2 and oxygen fraction;
In case of a titrated oxygen flow of more than 15L/min, the oxygen fraction should be entered. The maximum allowable value in the data form should be reset from 26 to 15L/min;
Oxygen titration also applies to ventilated patients.

- *Supplemental oxygen*

The most recent value in date and time of the amount of minimum oxygen needed to obtain an SpO2 of 90-92% at rest must be entered.

- *Highest-lowest PCO2 values*

Irrespective of the supplemental oxygen setting the highest and lowest pCO2 value should be entered. For highest and lowest pCO2 only blood gases at rest within the last three months should be used. Venous, transcutaneous blood gases and blood gases during exercise are not allowed to use for pCO2 trend.

- *6-MWT*

The 6MWT should be performed with the flow rate needed during exercise.

- *Continuous mechanical ventilation*

Patient on continuous mechanical ventilation ***with*** sedation' will be replaced by 'Patient on continuous mechanical ventilation' thus including patients on continuous mechanical ventilation ***without*** sedation

Full text of policy P-ThAC06.16 ECLS re-evaluation

- If a patient on ECLS has to be reevaluated within 6 days after getting on ECLS, the pre-ECLS settings on blood gases, oxygen and ventilator demands should be entered. If the re-evaluation takes place after at least 7 days or more, the current ventilator requirements, oxygen demand and blood gases should be entered. If weaning attempts have been made they have to be documented. In case of a calculated LAS that does not reflect the current clinical situation the center may request an eLAS. If the eLAS request is accepted, the LAS value equivalent to the 99th percentile of the waiting list has to be applied. This rule applies for all indications.

The duration of the highest and lowest pCO2 values of 3 months is only applicable for Germany, for the other countries the time interval of 6 months remains in place.

Testing and entering of blood gas samples is the responsibility of the transplant centers, Eurotransplant cannot check the circumstances.

For Germany: Standard definitions for measuring LAS parameters have been defined and were implemented on November 7, 2017. (see BAEK Guidelines). The adherence to these definitions is the responsibility of the transplant centers.

P-ThAC03.19 - Documentation and measurement of the LAS parameters. The full document can be found at the end of the manual as Annex 1

6.3.3.2. Additional items

In order to further study a future adaptation of the LAS system, the Eurotransplant Thoracic Advisory Committee (EThAC) has decided that the following data must also be submitted to Eurotransplant

- end saturation after six minute walk test
- estimated right ventricular systolic pressure
- presence of pneumothorax with drain
- need for a combined lung transplant
- need for extracorporal support
- IV-prostanoids
- Bilirubine
- Coagulopathy

6.3.4. Types of LAS

- Low LAS
- High LAS
- Exceptional LAS

6.3.4.1. Low and high LAS

Transplant candidates with a LAS value below 50 are labeled Low LAS candidates; those with a LAS of 50 or higher are the High LAS candidates. The exchange of donor lungs between countries is determined by the country balances and the value of the LAS
Patients from country Y with a High LAS will appear on top of the match list of country X, in case country Y has a negative total balance with country X.
Patients from country Y with a Low LAS will appear among the elective/low LAS patients from country X, in case country Y has a negative total balance with country X.

6.3.4.2. Exceptional LAS

In rare cases it might occur that the calculated LAS does not reflect the perceived idea of transplant benefit for a particular transplant candidate. In these cases it is possible to apply for an exceptional LAS. This can be done by proposing an alternative LAS value accompanied with a detailed description of the underlying reasoning. Every proposal for an exceptional LAS value will be evaluated by a the LAS review board (RB). In case the RB members agree with the suggested exceptional LAS value, the value will then be assigned to the patient. The decision of the RB members is binding. In case the RB members decline the request for an exceptional LAS, the calculated LAS will be used. Only in case new clinical information is available, the centers can submit another request for an exceptional LAS.
If the patient meets at least one of the following criteria, a request for an Exceptional LAS can be submitted:

1. Primary Pulmonary Hypertension types 1 and 4 [3];

[3] Guidelines for the diagnosis and treatment of pulmonary hypertension. European Heart Journal 2009; 30: 2493-2537.

2. Combined lung and non-renal transplant candidates;
3. Rare diseases not specified in LAS Diagnosis List;
4. Specific situations in which the LAS does not reflect the expected urgency and benefit

In addition, a request for an exceptional LAS for patients listed in Austria or Belgium can only be submitted if the patient has a national HU status.

6.3.5. Applying for LAS

For patients already registered on the lung transplant waiting list a calculated LAS can be obtained by submitting a request to Eurotransplant via the Thoracic Clinical Profile Application (go to the “library” on the member site).

If a new patient is registered on the lung transplant waiting list, the Thoracic Clinical Profile Application is an integral part of the registration process in ENIS.

The LAS request consists of the above mentioned LAS values (see section 6.3.2), a clinical letter and original data (additional laboratory values and functional test results) that support the values and data entered in the Thoracic Clinical Profile Application.

6.3.5.1. Low or high LAS

6.3.5.1.1. Certification low and high LAS

A random number of LAS entries are audited (random audit) by the Eurotransplant Staff. Every High LAS case is audited. The auditing process consists out of checking the submitted data with the original lab data. A notification will appear if your patient was selected for this audit.

6.3.5.1.2. Recertification low LAS

The LAS status for a patient listed in Germany is valid for 90 days, for patients listed in Austria, Belgium or the Netherlands the LAS status is valid for 180 days. Patients whose validation date has expired receive a LAS of 0. In order to retain the LAS value, updated information is to be delivered.

6.3.5.1.3. Recertification high LAS

A high LAS status is valid for 14 days, this holds true for all patients registered in Eurotransplant. After this period of 14 days, new data need to be submitted to Eurotransplant, if the calculated LAS based on these renewed data is at least 50, the submitted original data will be checked.

6.3.5.2. Exceptional LAS

Applying for Exceptional LAS status is done by submitting a request to Eurotransplant via the Thoracic Clinical Profile Application. This request consists of 2 parts: a request for Exceptional LAS and a request for a

calculated LAS value. Furthermore when applying for the Exceptional LAS, a requesting center needs to motivate why a patient is to be considered for an exceptional LAS .This request is sent to the LAS Review Board members (see section 6.3.6).

6.3.5.2.1. Reconfirmation exceptional LAS

The exceptional LAS status is valid for 56 days. If a patient is still on the waiting list after that period, and the center considers the patient still to be eligible for an exceptional LAS status a renewed request can be submitted in the same way as a first request for an exceptional LAS status (see section 6.3.6.1).

6.3.6. Audit / Review Board

6.3.6.1. Exceptional LAS

Exceptional LAS requests are sent the LAS Review Board. Three LAS review boards are established, a German LAS review board that judges upon request from German transplant programs, a Dutch LAS review board that judges upon request from Dutch transplant programs and an international LAS review board that judges upon requests from transplant programs in Austria and Belgium.
The LAS RB members are expected to concur on their decision and one un-split decision is submitted to Eurotransplant within 7 days.

6.3.6.2. Other: Estimated value

6.3.6.2.1. Six minute walk test [6-MWT]

If a patient cannot perform a 6MWT which is not related to the underlying lung disease, the transplant center can suggest an estimated value for this test. The audit group will evaluate these cases in a similar way as described for the exceptional LAS values. This estimated value can then be used for the calculated LAS.

6.3.6.2.2. Reconfirmation estimated value Six Minute Walk Test:

This estimated value is valid for 8 weeks, after which a new request needs to be done.

6.3.7. Lung allocation in Austria, Belgium, Croatia, Hungary, Slovenia

National allocation is based on the urgency tier system. The international exchange of all donor lungs is based on the LAS system. For all patients a calculated LAS can be requested, see section 6.3.5. All active adult patients receive a LAS 0 if no calculated LAS is requested, all active pediatric patients receive a LAS 100.
Croatia, Hungary and Slovenia do not have a national lung transplant programs. Patients from these countries are listed in Vienna, Austria; all donor

lungs from these countries are considered by the ET twinning policy as local donors from Vienna.

6.3.7.1. Overview urgency statuses

6.3.7.2. Urgency codes for lung transplant candidates

Urgency statuses are used to classify transplant candidates on the waiting list and to prioritize the recipients in the thoracic organ match and allocation procedure. The urgency statuses reflect transplantability and medical urgency.

6.3.7.3. Overview table urgency status lung

Lung urgency codes in EThAS			
Urgency code		**Transplantable**	**Medical Urgency**
HU^	High Urgency	Yes	High Urgent
ACO^	Approved Combined Organ	Yes	More priority in match
T	Transplantable	Yes	Normal
NT	Not Transplantable	No	n.a.*

^ only national status
* n.a. = not applicable

6.3.7.4. High urgency status: national

Due to the implementation of LAS the HU International Status has been abolished. There is only the HU National Status.

The national HU Status is granted according to national policies. These vary per Eurotransplant member state. The national HU Status does not apply to Germany and the Netherlands.

6.3.7.5. Approved combined organs (ACO)

For patients in need of a multi-organ transplant -except the combination lung with kidney- the ACO status can be requested.

6.3.7.5.1. Applying for the ACO status

A complete documentation and appropriate justification in English of the request for ACO status must be sent to the Eurotransplant duty desk by use of the ACO forms (website). This request is then forwarded to a member of the ET thoracic committee and, depending on the other organ(s), a member of the ET pancreas committee, or a member of the ET liver & intestine committee. The organ committee members who judge upon the ACO request are national representatives of countries different from the requesting country. The organ committee members will be given 24 hours to reach a decision. If no consensus is reached, a third organ committee member will decide on the ACO request. Upon granting of the ACO status, the Eurotransplant duty officers will adapt the status accordingly.

6.3.7.5.2. Transplantable (T)

The urgency status, transplantable (T) is used for elective transplant candidates who are not eligible for urgency statuses HU or ACO. Time spent in the T status is not limited.

6.3.7.6. Not Transplantable (NT)

Recipients who are temporarily not transplantable should be placed in urgency NT in ENIS by the transplant center. Days spent in NT (no matter the previous urgency status, HU or T) on the waiting list are not taken into account in the calculation of waiting time. It is not possible to request a LAS value if the patient is in an NT status. The LAS values become invalid upon NT status, hence after each NT status a new LAS request has to be submitted.

6.3.7.6.1. Deviant regulations

6.3.7.6.2. Return HU waiting time after NT status

A transplant candidate with HU status, who is subsequently downgraded to T or NT status, but is thereafter re-listed with an HU status within a time span of maximum 28 days, will not lose the previously accumulated HU waiting time.

6.3.7.6.3. Reporting the NT status

In order achieve a maximum efficiency of the allocation process all changes from active urgency statuses to NT status should immediately be recorded in ENIS. It is the responsibility of the transplant center to place the patient in the correct urgency status if the patient's condition improves or further deteriorates. Furthermore, if the patient's condition worsens beyond transplantability, the transplant center should remove the patient from the waiting list.

6.3.7.6.4. Pediatric transplant candidates

A pediatric transplant candidate is a patient under the age of 12 years. All pediatric patients who are registered on the waiting list in an active urgency status receive a LAS of 100.

6.3.7.7. Applying for the HU National Status

6.3.7.7.1. Overview table ET countries and their HU status possibilities

Country	**HU National**
Belgium	+
Croatia	*via Vienna
Slovenia	*via Vienna
Hungary	*via Vienna

Austria	+

6.3.7.7.1.1. Deviant regulations

6.3.7.7.1.1.1. Croatia, Hungary and Slovenia

Croatia, Hungary and Slovenia do not have a lung transplant program. Their lung recipients are registered on the waiting list in Vienna, Austria.

6.3.7.7.2. Procedure: Applying for HU national status

Notification of the national HU status is done by the center in ENIS.

6.3.7.8. Duration HU status

The HU National Status has an unlimited time frame.

6.3.7.9. Allocation factors

For exact ranking see the Allocation Algorithms, see section 6.4.

6.3.7.9.1. Rank Tier system

The ranking of potential recipients is based on several characteristics. These characteristics include the following patient factors: the LAS score, the medical urgency status, the type of organ (heart beating or non-heart beating (except for Germany), the resident status (only in Belgium). Furthermore the donor- to-recipient AB0 blood group relation as well as the donor-to-recipient country balance are considered.

The ranking scheme is dependent on the donor's age and blood group. (see section 6.4.2).

6.3.7.9.1.1. Country balance donor country

The balance between the donor and recipient countries is defined as the cumulative difference between the numbers of transplants performed in country X with donor lungs imported from country Y and the number of lung transplants performed in country Y with donor lungs from country X. The balance is calculated as of September 1, 2004.

The total balance takes all lung transplants into account.

A negative country balance for country X with country Y is reached if country X exported more lungs to country Y, and which are subsequently used for transplantation, than the number of donor lungs from country Y returned and used for transplantation in country X.

Note: as the number of transplants is counted, a double lung transplant is counted as one event.

6.3.7.9.1.2. Medical Urgency status:

The following medical urgency statuses are used (except for Germany and the Netherlands): national high urgent status, approved combined organ status, elective status and not transplantable status see also 6.3.7.3. Patients who are registered as not transplantable are not selected in the match.

6.3.7.9.1.3. Lung match

6.3.7.9.1.3.1. Donor information requirements

Donor characteristics required in order to generate a lung match:

- donor total lung capacity (TLC) (min and max)
- donor age (min and max)
- Acceptance of a heart from a donor who is/has:
    - HBsAG pos
    - HBcAb pos
    - HCV pos
    - CMV
    - Sepsis
    - Meningitis
    - Malignant tumor
    - Drug abuse
    - Domino donor

Additional donor filtering rule in Germany
The donor‘s allowed TLC range can be maximum 10% lower and 20% higher to the recipient’s TLC. This rule has two exceptions: patients who have a special anatomical situation and patients with a TLC < 5L where a size reduction was planned. In case of a special anatomical situation, the recipient’s TLC should be adapted in the ENIS system; and based on this new recipient TLC, the new maximum (+20%) and new minimum (-10%) donor ranges are calculated and used for donor selection. In case of a recipient TLC < 5L **and** if a planned size reduction is recorded in the ENIS system, the donor profile has no maximum TLC value.

6.3.7.9.1.3.2. Formula for calculating Total Lung Capacity (TLC)[4]

See section 6.2.5.1.3.1.

6.3.7.9.1.4. Donation after Cardiac Death (DCD) transplantation

[4] Zapletal et al. Standardization of lung function tests in pediatrics. The European Respiratory Journal 1989; 2, Supll 4. Ed. The Working Group Pediatrics SEPCR.

In the Netherlands, Belgium, Austria, Luxemburg and Slovenia donation after cardiac death (DCD) donations are considered legal procedures and are ethically accepted. Lungs from a DCD donors are allocated according to the same allocation algorithm as for donation after brain death (DBD) donors. The above mentioned member states have different regulations regarding the DCD.

In Germany, Croatia and Hungary DCD donations do not take place.

6.3.7.9.1.4.1. The Netherlands

In case of a non-renal DCD donor category III, there is no maximum allocation time, but only if the planned ventilator switch-off time (i.e. cessation of treatment) is known. The allocation process of this potential donor can be started once this planned switch-off time is reported.

6.3.7.9.1.4.2. Deviant national regulations

Belgium
Non- resident transplant candidates registered in Belgium are offered a donor lung after all Eurotransplant residents.

Germany and Hungary
Organs from DCD donors cannot be procured and/or allocated in Germany and Hungary. DCD donor organs from outside Germany and Hungary cannot be allocated and/or transplanted in Germany and Hungary.

Croatia
Croatia has ethical objections to DCD procedures, therefore no DCD donations or transplants are carried out.

6.3.7.9.1.5. AB0 Blood Group Rules

Two different AB0 blood group schemes are defined. The applications of these schemes vary by country.

AB0 modified

			Recipient		
		A	AB	B	0
Donor	A	x	x		
	AB		x		
	B			x	
	0			x	x

AB0 compatible

			Recipient		
		A	AB	B	0

Donor	A	x	x		
	AB		x		
	B		x	x	
	0	x	x	x	x

In all countries lungs are allocated:

- first according to the modified AB0 compatible rule (AB0-0 to AB0-0 and -B; AB0-A to AB0-A and -AB; AB0-B to AB0-B; AB0-AB to AB0-AB);
- then according to the AB0 compatible rule (AB0-0 to AB0-0, -B, -A, -AB; AB0-A to AB0-A and -AB; AB0-B to AB0-B and -AB; AB0-AB to AB0-AB).

6.3.7.9.1.6. Waiting time national

Waiting time is counted in days in the urgencies HU and T. The HU and T days are added up. NT time is not taken into account.

6.3.7.9.2. Rank Sub Tier system

6.3.7.9.2.1. Pediatric donor allocation

For all countries lungs from donors
• aged <12 years go first to recipients <12 years, then to recipients aged 12 - 17 years, and then to recipients ≥18 years;
• aged 12 – <=17 years go first to recipients 12 - 17 years, then to recipients <12 years, then to recipients ≥18 years.
-aged >= 18 y go first to recipients >=12 years then to recipients < 12 y

Except in Germany all lungs from donor >= 18 years are allocated to all recipients irrespective of their age.

6.3.7.9.2.2. 10% Extended donor TLC profile

In order to avoid the situation that a donor offer is missed because the donor' s TLC falls outside the donor profile and to avoid the situation that transplant centers cope with this issue by extending the donor profile to unrealistic extremes the 10% donor TLC rule is introduced in all Eurotransplant member states, except Germany and the Netherlands.
Donor lungs are only offered to those transplant candidates where the designated donor profile encompasses this specific donor TLC. According to the 10% rule transplant candidates are selected whose designated donor profile 10% is extended.
The 10% extended donor TLC profile is calculated as follows: minimum TLC in the donor profile minus 10% of this minimum value and maximum TLC in the donor profile plus 10% of this maximum value.

6.3.7.9.2.3. Deviant national regulation

6.3.7.9.2.3.1. Germany and The Netherlands

The 10 % donor height profile does not exist for German and Dutch donors and recipients.

6.4. Allocation Algorithms

6.4.1. Introduction

All match lists are determined by the donor country. National transplant candidates are those patients who are listed in the same country as from where the donor originated.

As an example of how to read the allocation algorithms, the first few tiers of the Austrian heart and heart-lung algorithm are described below:

First
the organs are offered to hospitalized children with an international HU status and who are listed in a country with a negative HU balance with Austria international hospitalized and who are AB0 blood group compatible according to the ET compatible scheme and who are listed for a combined heart-lung block,

then to
hospitalized children with an international HU status and who are listed in a country with a negative HU balance with Austria international hospitalized and who are AB0 blood group compatible according to the ET compatible scheme and who are listed for a heart,

then to
hospitalized children with an international HU status and who are listed in a country with a negative HU balance with Austria international hospitalized and who are AB0 blood group compatible according to the AB0 compatible scheme and who are listed for a heart-lung block,

then to
hospitalized children with an international HU status and who are listed in a country with a negative HU balance with Austria international hospitalized and who are AB0 blood group compatible according to the AB0 compatible scheme and who are listed for a heart,

then to
patients with an international HU status and who are listed in a country with a negative HU balance with Austria and who are AB0 blood group compatible according to the ET compatible scheme and who are listed for a heart-lung block,

6.4.2. Heart and heart lung schemes

6.4.2.1. Austria

Main rank tiers	1st sub rank tier	2nd sub rank tier
Int'l HU (neg. HU balance) and hospitalized child	ET comp	Heart-Lung
Int'l HU (neg. HU balance) and hospitalized child	ET comp	Heart only
Int'l HU (neg. HU balance) and hospitalized child	ABO comp	Heart-Lung
Int'l HU (neg. HU balance) and hospitalized child	ABO comp	Heart only
Int'l HU (neg. HU balance)	ET comp	Heart-Lung
Int'l HU (neg. HU balance)	ET comp	Heart only
Int'l HU (neg. HU balance)	ABO comp	Heart-Lung
Int'l HU (neg. HU balance)	ABO comp	Heart only
Local HU and hospitalized child	ET comp	Heart-Lung
Local HU and hospitalized child	ET comp	Heart only
Local HU and hospitalized child	ABO comp	Heart-Lung
Local HU and hospitalized child	ABO comp	Heart only
Local HU	ET comp	Heart-Lung
Local HU	ET comp	Heart only
Local HU	ABO comp	Heart-Lung
Local HU	ABO comp	Heart only
Regional HU and hospitalized child	ET comp	Heart-Lung
Regional HU and hospitalized child	ET comp	Heart only
Regional HU and hospitalized child	ABO comp	Heart-Lung
Regional HU and hospitalized child	ABO comp	Heart only
Regional HU	ET comp	Heart-Lung
Regional HU	ET comp	Heart only
Regional HU	ABO comp	Heart-Lung
Regional HU	ABO comp	Heart only
[Nat. HU or Int'l HU (neg. total balance)] and hospitalized child	ET comp	Heart-Lung
[Nat. HU or Int'l HU (neg. total balance)] and hospitalized child	ET comp	Heart only
[Nat. HU or Int'l HU (neg. total balance)] and hospitalized child	ABO comp	Heart-Lung
[Nat. HU or Int'l HU (neg. total balance)] and hospitalized child	ABO comp	Heart only
Nat. HU or Int'l HU (neg. total balance)	ET comp	Heart-Lung
Nat. HU or Int'l HU (neg. total balance)	ET comp	Heart only
Nat. HU or Int'l HU (neg. total balance)	ABO comp	Heart-Lung
Nat. HU or Int'l HU (neg. total balance)	ABO comp	Heart only
Nat. ACO	ET comp	Heart-Lung
Nat. ACO	ET comp	Heart only
Nat. ACO	ABO comp	Heart-Lung
Nat. ACO	ABO comp	Heart only
Local Elective	ET comp	Heart-Lung
Local Elective	ET comp	Heart only
Local Elective	ABO comp	Heart-Lung

Local Elective	ABO comp	Heart only
National Elective	ET comp	Heart-Lung
National Elective	ET comp	Heart only
National Elective	ABO comp	Heart-Lung
National Elective	ABO comp	Heart only
Repeat the above for the 10% rule		
Int'l HU and hospitalized child	ET comp	Heart-Lung
Int'l HU and hospitalized child	ET comp	Heart only
Int'l HU and hospitalized child	ABO comp	Heart-Lung
Int'l HU and hospitalized child	ABO comp	Heart only
Int'l HU	ET comp	Heart-Lung
Int'l HU	ET comp	Heart only
Int'l HU	ABO comp	Heart-Lung
Int'l HU	ABO comp	Heart only
Int'l ACO	ET comp	Heart-Lung
Int'l ACO	ET comp	Heart only
Int'l ACO	ABO comp	Heart-Lung
Int'l ACO	ABO comp	Heart only
Int'l Elective	ET comp	Heart-Lung
Int'l Elective	ET comp	Heart only
Int'l Elective	ABO comp	Heart-Lung
Int'l Elective	ABO comp	Heart only
Repeat the above for the 10% rule		
Children aged < 2 years with incompatible ABO and centre has protocol		
Belgian non-residents		

6.4.2.2. Belgium and Luxemburg

Main rank tiers	**1st sub rank tier**	**2nd sub rank tier**
Int'l HU (neg. HU balance) and hospitalized child	ET comp	Heart-Lung
Int'l HU (neg. HU balance) and hospitalized child	ET comp	Heart only
Int'l HU (neg. HU balance) and hospitalized child	ABO comp	Heart-Lung
Int'l HU (neg. HU balance) and hospitalized child	ABO comp	Heart only
Int'l HU (neg. HU balance)	ET comp	Heart-Lung
Int'l HU (neg. HU balance)	ET comp	Heart only
Int'l HU (neg. HU balance)	ABO comp	Heart-Lung
Int'l HU (neg. HU balance)	ABO comp	Heart only
[Nat. HU or Int'l HU (neg. total balance)] and hospitalized child	Heart-Lung	ET comp
[Nat. HU or Int'l HU (neg. total balance)] and hospitalized child	Heart-Lung	ABO comp
Nat. HU or Int'l HU (neg. total balance)	Heart-Lung	ET comp
Nat. HU or Int'l HU (neg. total balance)	Heart-Lung	ABO comp
Regional HU hospitalized child	Heart only	ET comp
Regional HU hospitalized child	Heart only	ABO comp
Regional HU	Heart only	ET comp
Regional HU	Heart only	ABO comp

[Nat. HU or Int'l HU (neg. total balance)] and hospitalized child	Heart only	ET comp
[Nat. HU or Int'l HU (neg. total balance)] and hospitalized child	Heart only	ABO comp
Nat. HU or Int'l HU (neg. total balance)	Heart only	ET comp
Nat. HU or Int'l HU (neg. total balance)	Heart only	ABO comp
Nat. ACO	Heart-Lung	ET comp
Nat. ACO	Heart-Lung	ABO comp
Nat. ACO	Heart only	ET comp
Nat. ACO	Heart only	ABO comp
National elective	Heart-Lung	ET comp
National elective	Heart-Lung	ABO comp
Regional Elective	Heart only	ET comp
Regional Elective	Heart only	ABO comp
National Elective	Heart only	ET comp
National Elective	Heart only	ABO comp
Repeat the above for the 10% rule		
Int'l HU and hospitalized child	ET comp	Heart-Lung
Int'l HU and hospitalized child	ET comp	Heart only
Int'l HU and hospitalized child	ABO comp	Heart-Lung
Int'l HU and hospitalized child	ABO comp	Heart only
Int'l HU	ET comp	Heart-Lung
Int'l HU	ET comp	Heart only
Int'l HU	ABO comp	Heart-Lung
Int'l HU	ABO comp	Heart only
Int'l ACO	ET comp	Heart-Lung
Int'l ACO	ET comp	Heart only
Int'l ACO	ABO comp	Heart-Lung
Int'l ACO	ABO comp	Heart only
Int'l Elective	ET comp	Heart-Lung
Int'l Elective	ET comp	Heart only
Int'l Elective	ABO comp	Heart-Lung
Int'l Elective	ABO comp	Heart only
Repeat the above for the 10% rule		
Children aged < 2 years with incompatible ABO and centre has protocol		
Belgian non-residents		

6.4.2.3. Croatia, Hungary and Slovenia

Main rank tiers	**1st sub rank tier**	**2nd sub rank tier**
Int'l HU (neg. HU balance) and hospitalized child	ET comp	Heart-Lung
Int'l HU (neg. HU balance) and hospitalized child	ET comp	Heart only
Int'l HU (neg. HU balance) and hospitalized child	ABO comp	Heart-Lung
Int'l HU (neg. HU balance) and hospitalized child	ABO comp	Heart only
Int'l HU (neg. HU balance)	ET comp	Heart-Lung
Int'l HU (neg. HU balance)	ET comp	Heart only
Int'l HU (neg. HU balance)	ABO comp	Heart-Lung

Int'l HU (neg. HU balance)	ABO comp	Heart only
[Nat. HU or Int'l HU (neg. total balance)] and hospitalized child	ET comp	Heart-Lung
[Nat. HU or Int'l HU (neg. total balance)] and hospitalized child	ET comp	Heart only
[Nat. HU or Int'l HU (neg. total balance)] and hospitalized child	ABO comp	Heart-Lung
[Nat. HU or Int'l HU (neg. total balance)] and hospitalized child	ABO comp	Heart only
Nat. HU or Int'l HU (neg. total balance)	ET comp	Heart-Lung
Nat. HU or Int'l HU (neg. total balance)	ET comp	Heart only
Nat. HU or Int'l HU (neg. total balance)	ABO comp	Heart-Lung
Nat. HU or Int'l HU (neg. total balance)	ABO comp	Heart only
Nat. ACO	ET comp	Heart-Lung
Nat. ACO	ET comp	Heart only
Nat. ACO	ABO comp	Heart-Lung
Nat. ACO	ABO comp	Heart only
National Elective	ET comp	Heart-Lung
National Elective	ET comp	Heart only
National Elective	ABO comp	Heart-Lung
National Elective	ABO comp	Heart only
Repeat the above for the 10% rule		
Int'l HU and hospitalized child	ET comp	Heart-Lung
Int'l HU and hospitalized child	ET comp	Heart only
Int'l HU and hospitalized child	ABO comp	Heart-Lung
Int'l HU and hospitalized child	ABO comp	Heart only
Int'l HU	ET comp	Heart-Lung
Int'l HU	ET comp	Heart only
Int'l HU	ABO comp	Heart-Lung
Int'l HU	ABO comp	Heart only
Int'l ACO	ET comp	Heart-Lung
Int'l ACO	ET comp	Heart only
Int'l ACO	ABO comp	Heart-Lung
Int'l ACO	ABO comp	Heart only
Int'l Elective	ET comp	Heart-Lung
Int'l Elective	ET comp	Heart only
Int'l Elective	ABO comp	Heart-Lung
Int'l Elective	ABO comp	Heart only
Repeat the above for the 10% rule		
Children aged < 2 years with incompatible ABO and centre has protocol		
Belgian non-residents		

6.4.2.4. Germany

Main rank tiers	1st sub rank tier	2nd sub rank tier	3rd sub rank tier
Int'l HU (neg. HU balance) and hospitalized child	ET comp	Heart-Lung	

Int'l HU (neg. HU balance) and hospitalized child	ET comp	Heart only	
Int'l HU (neg. HU balance) and hospitalized child	ABO comp	Heart-Lung	
Int'l HU (neg. HU balance) and hospitalized child	ABO comp	Heart only	
Int'l HU (neg. HU balance)	ET comp	Heart-Lung	
Int'l HU (neg. HU balance)	ET comp	Heart only	
Int'l HU (neg. HU balance)	ABO comp	Heart-Lung	
Int'l HU (neg. HU balance)	ABO comp	Heart only	
[Nat. HU or Int'l HU (neg. total balance)] and hospitalized child	Heart-Lung	Highly Immunized	ABO identical
[Nat. HU or Int'l HU (neg. total balance)] and hospitalized child	Heart-Lung	Highly Immunized	mod. ABO comp
[Nat. HU or Int'l HU (neg. total balance)] and hospitalized child	Heart-Lung	Highly Immunized	ABO comp
[Nat. HU or Int'l HU (neg. total balance)] and hospitalized child	Heart-Lung	Not Immunized	ABO identical
[Nat. HU or Int'l HU (neg. total balance)] and hospitalized child	Heart-Lung	Not Immunized	mod. ABO comp
[Nat. HU or Int'l HU (neg. total balance)] and hospitalized child	Heart-Lung	Not Immunized	ABO comp
[Nat. HU or Int'l HU (neg. total balance)] and hospitalized child	Heart only	Highly Immunized	ABO identical
[Nat. HU or Int'l HU (neg. total balance)] and hospitalized child	Heart only	Highly Immunized	mod. ABO comp
[Nat. HU or Int'l HU (neg. total balance)] and hospitalized child	Heart only	Highly Immunized	ABO comp
[Nat. HU or Int'l HU (neg. total balance)] and hospitalized child	Heart only	Not Immunized	ABO identical
[Nat. HU or Int'l HU (neg. total balance)] and hospitalized child	Heart only	Not Immunized	mod. ABO comp
[Nat. HU or Int'l HU (neg. total balance)] and hospitalized child	Heart only	Not Immunized	ABO comp
Nat. HU or Int'l HU (neg. total balance)	Heart-Lung	Highly Immunized	ABO identical
Nat. HU or Int'l HU (neg. total balance)	Heart-Lung	Highly Immunized	mod. ABO comp
Nat. HU or Int'l HU (neg. total balance)	Heart-Lung	Highly Immunized	ABO comp
Nat. HU or Int'l HU (neg. total balance)	Heart-Lung	Not Immunized	ABO identical
Nat. HU or Int'l HU (neg. total balance)	Heart-Lung	Not Immunized	mod. ABO comp
Nat. HU or Int'l HU (neg. total balance)	Heart-Lung	Not Immunized	ABO comp
Nat. HU or Int'l HU (neg. total balance)	Heart only	Highly Immunized	ABO identical
Nat. HU or Int'l HU (neg. total balance)	Heart only	Highly Immunized	mod. ABO comp
Nat. HU or Int'l HU (neg. total balance)	Heart only	Highly Immunized	ABO comp

Nat. HU or Int'l HU (neg. total balance)	Heart only	Not Immunized	ABO identical
Nat. HU or Int'l HU (neg. total balance)	Heart only	Not Immunized	mod. ABO comp
Nat. HU or Int'l HU (neg. total balance)	Heart only	Not Immunized	ABO comp
Nat. ACO	Heart-Lung	Highly Immunized	ABO identical
Nat. ACO	Heart-Lung	Highly Immunized	mod. ABO comp
Nat. ACO	Heart-Lung	Highly Immunized	ABO comp
Nat. ACO	Heart-Lung	Not Immunized	ABO identical
Nat. ACO	Heart-Lung	Not Immunized	mod. ABO comp
Nat. ACO	Heart-Lung	Not Immunized	ABO comp
Nat. ACO	Heart only	Highly Immunized	ABO identical
Nat. ACO	Heart only	Highly Immunized	mod. ABO comp
Nat. ACO	Heart only	Highly Immunized	ABO comp
Nat. ACO	Heart only	Not Immunized	ABO identical
Nat. ACO	Heart only	Not Immunized	mod. ABO comp
Nat. ACO	Heart only	Not Immunized	ABO comp
Nat. Elective	Heart-Lung	Highly Immunized	ABO identical
Nat. Elective	Heart-Lung	Highly Immunized	mod. ABO comp
Nat. Elective	Heart-Lung	Highly Immunized	ABO comp
Nat. Elective	Heart-Lung	Not Immunized	ABO identical
Nat. Elective	Heart-Lung	Not Immunized	mod. ABO comp
Nat. Elective	Heart-Lung	Not Immunized	ABO comp
Nat. Elective	Heart only	Highly Immunized	ABO identical
Nat. Elective	Heart only	Highly Immunized	mod. ABO comp
Nat. Elective	Heart only	Highly Immunized	ABO comp
Nat. Elective	Heart only	Not	ABO

		Immunized	identical
Nat. Elective	Heart only	Not Immunized	mod. ABO comp
Nat. Elective	Heart only	Not Immunized	ABO comp
Int'l HU and hospitalized child	ET comp	Heart-Lung	
Int'l HU and hospitalized child	ET comp	Heart only	
Int'l HU and hospitalized child	ABO comp	Heart-Lung	
Int'l HU and hospitalized child	ABO comp	Heart only	
Int'l HU	ET comp	Heart-Lung	
Int'l HU	ET comp	Heart only	
Int'l HU	ABO comp	Heart-Lung	
Int'l HU	ABO comp	Heart only	
Int'l ACO	ET comp	Heart-Lung	
Int'l ACO	ET comp	Heart only	
Int'l ACO	ABO comp	Heart-Lung	
Int'l ACO	ABO comp	Heart only	
Int'l Elective	ET comp	Heart-Lung	
Int'l Elective	ET comp	Heart only	
Int'l Elective	ABO comp	Heart-Lung	
Int'l Elective	ABO comp	Heart only	
Children aged < 2 years with incompatible ABO and centre has protocol			
Belgian non-residents			

6.4.2.5. The Netherlands

Main rank tiers	**1st sub rank tier**	**2nd sub rank tier**
Int'l HU (neg. HU balance) and hospitalized child	ET comp	Heart-Lung
Int'l HU (neg. HU balance) and hospitalized child	ET comp	Heart only
Int'l HU (neg. HU balance) and hospitalized child	ABO comp	Heart-Lung
Int'l HU (neg. HU balance) and hospitalized child	ABO comp	Heart only
Int'l HU (neg. HU balance)	ET comp	Heart-Lung
Int'l HU (neg. HU balance)	ET comp	Heart only
Int'l HU (neg. HU balance)	ABO comp	Heart-Lung
Int'l HU (neg. HU balance)	ABO comp	Heart only
[Nat. 1A HU or Int'l HU (neg. total balance)] and hospitalized child	ET comp	Heart-Lung
[Nat. 1A HU or Int'l HU (neg. total balance)] and hospitalized child	ET comp	Heart only
[Nat. 1A HU or Int'l HU (neg. total balance)] and hospitalized child	ABO comp	Heart-Lung
[Nat. 1A HU or Int'l HU (neg. total balance)] and hospitalized child	ABO comp	Heart only
[Nat. 1A HU or Int'l HU (neg. total balance)]	ET comp	Heart-Lung
[Nat. 1A HU or Int'l HU (neg. total balance)]	ET comp	Heart only
[Nat. 1A HU or Int'l HU (neg. total balance)]	ABO comp	Heart-Lung

[Nat. 1A HU or Int'l HU (neg. total balance)]	ABO comp	Heart only
[Nat. 1B HU	ET comp	Heart-Lung
[Nat. 1B HU	ET comp	Heart only
[Nat. 1B HU	ABO comp	Heart-Lung
[Nat. 1B HU	ABO comp	Heart only
Nat. ACO	ET comp	Heart-Lung
Nat. ACO	ET comp	Heart only
Nat. ACO	ABO comp	Heart-Lung
Nat. ACO	ABO comp	Heart only
National Elective	ET comp	Heart-Lung
National Elective	ET comp	Heart only
National Elective	ABO comp	Heart-Lung
National Elective	ABO comp	Heart only
Repeat the above for the 10% rule		
Int'l HU and hospitalized child	ET comp	Heart-Lung
Int'l HU and hospitalized child	ET comp	Heart only
Int'l HU and hospitalized child	ABO comp	Heart-Lung
Int'l HU and hospitalized child	ABO comp	Heart only
Int'l HU	ET comp	Heart-Lung
Int'l HU	ET comp	Heart only
Int'l HU	ABO comp	Heart-Lung
Int'l HU	ABO comp	Heart only
Int'l ACO	ET comp	Heart-Lung
Int'l ACO	ET comp	Heart only
Int'l ACO	ABO comp	Heart-Lung
Int'l ACO	ABO comp	Heart only
Int'l Elective	ET comp	Heart-Lung
Int'l Elective	ET comp	Heart only
Int'l Elective	ABO comp	Heart-Lung
Int'l Elective	ABO comp	Heart only
Repeat the above for the 10% rule		
Children aged < 2 years with incompatible ABO and centre has protocol		
Belgian non-residents		

6.4.3. Lung Allocation Algorithms

6.4.3.1. General

For all Eurotransplant countries the international allocation rules are similar while the national allocation rules can differ.
In general the scheme is a follows, a donor lung is

First offered to
International patients with a high LAS (≥ 50) from countries with a negative total balance with the donor country, where all patients are sorted by LAS,

then to

the national transplant candidates according to the national rules, including the international patients with a low LAS (<50) from countries with a negative total balance with the donor country, where all patients are sorted by LAS (German or Dutch donor) or waiting time (Austrian or Belgian donor),

then to
the international patients from countries without a negative balance with the donor country, where all patients are sorted by LAS.

In general the national allocation schemes are as follows.
For instance for a lung donor from Belgium, the offer is first made to the patients with a national HU status, then to the national ACO patients, then to the local or regional elective patients and finally to the national elective patients and the international low LAS patients.

Germany and Netherlans	**Belgium**	**Austria**	**Slovenia/Croatia/ Hungary**
		Local HU	Vienna HU
National high LAS	National HU	National HU	National HU (Austria)
	ACO	ACO	ACO
	Local/ regional elective	Local elective	Local (Vienna) elective
National low LAS + International low LAS	National elective + International low LAS	National elective + International low LAS	National Elective (Austria) + International low LAS

6.4.3.2. Details

In order to understand and be able to read the allocation charts as listed below, some explanation is first warranted.
The charts below read as followed: from left to right, from top to bottom.

The match list is built as followed:

- Recipient category (recipient ranking on the match)
- Columns per donor age (Donor age < 12, Donor age donor >= 12 and <= 17, Donor age >= 18 years)
- 2 subtiers
  - Age
  - Blood group rules

Thereafter the patients are sorted by the LAS value or the waiting time.

Symbols and abbreviations in the match table

Symbol	Definition
< > Germany	not Germany
= Austria	is Austria
White fields	not applicable
LAS	Lung Allocation Score
WT	Waiting time
WL	Waiting list
Comp	compatible

6.4.3.2.1. Germany and Netherlands

In case of a German or Dutch donor the scheme is as follows:

	Donor age < 12				Donor age >= 12 and <= 17			Donor age >= 18 years		
Recipient category	Subtier 1	Subtier 2	Subtier 3		Subtier 1	Subtier 2	Subtier 3	Subtier 1	Subtier 2	Subtier 3
International high LAS and negative total balance	Age < 12 before age 12 - 17 before age >= 18	Modified ABO comp before ABO comp	LAS		Age 12 - 17 before age < 12 before age >= 18	Modified ABO comp before ABO comp	LAS		Modified ABO comp before ABO comp	LAS
National (high and low LAS) and International low LAS and negative total balance	Age < 12 before age 12 - 17 before age >= 18	Modified ABO comp before ABO comp	LAS		Age 12 - 17 before age < 12 before age >= 18	Modified ABO comp before ABO comp	LAS		Modified ABO comp before ABO comp	LAS
International high LAS and zero or positive total balance International low LAS and zero or positive total balance	Age < 12 before age 12 - 17 before age >= 18	Modified ABO comp before ABO comp	LAS		Age 12 - 17 before age < 12 before age >= 18	Modified ABO comp before ABO comp	LAS		Modified ABO comp before ABO comp	LAS

As an example of how to read this table a few rows from the scheme for lungs from a donor aged less than 12 years from Germany or the Netherlands are described below:

These lungs are first offered to
The international high LAS patients from countries with a negative total balance with Germany or the Netherlands, and aged under 12 years, and AB0 blood group compatible according to the modified AB0 scheme, all sorted by descending LAS

then to:
The international high LAS patients from countries with a negative total balance with Germany or the Netherlands, and aged between 12 and 17 years, and AB0 blood group compatible according to the modified AB0 scheme, all sorted by descending LAS

then to
The international high LAS patients from countries with a negative total balance with Germany or the Netherlands, and aged 18 or older, and AB0 blood group compatible according to the modified AB0 scheme, all sorted by descending LAS

then to
The international high LAS patients from countries with a negative total balance with Germany or the Netherlands, and aged under 12 years, and AB0 blood group compatible according to the AB0 compatible scheme, all sorted by descending LAS

then to:
The international high LAS patients from countries with a negative total balance with Germany or the Netherlands, and aged between 12 and 17 years, and AB0 blood group compatible according to the AB0 compatible scheme, all sorted by descending LAS

then to
The international high LAS patients from countries with a negative total balance with Germany or the Netherlands, and aged 18 or older, and AB0 blood group compatible according to the AB0 compatible scheme, all sorted by descending LAS

then to
National patients and international low LAS patients from countries with a negative total balance, and aged under 12 years and AB0 compatible according to the modified AB0 scheme, all sorted by LAS.

Etc.

6.4.3.2.2. Austria,Belgium Croatia, Hungary, Slovenia

The lung allocation scheme for donor lungs from Austria, Belgium, Croatia, Hungary, and Slovenia are as follows:

As an example of how to read this table a few rows from the scheme for lungs from a donor aged less than 12 years from Belgium are described below:

These lungs are first offered to
The international high LAS patients from countries with a negative total balance with Belgium, and aged under 12 years, and AB0 blood group compatible according to the modified AB0 scheme, all sorted by descending LAS,

then to:
The international high LAS patients from countries with a negative total balance with Belgium, and aged between 12 and 17 years, and AB0 blood group compatible according to the modified AB0 scheme, all sorted by descending LAS,

then to

The international high LAS patients from countries with a negative total balance with Belgium, and aged 18 or older, and AB0 blood group compatible according to the modified AB0 scheme, all sorted by descending LAS,

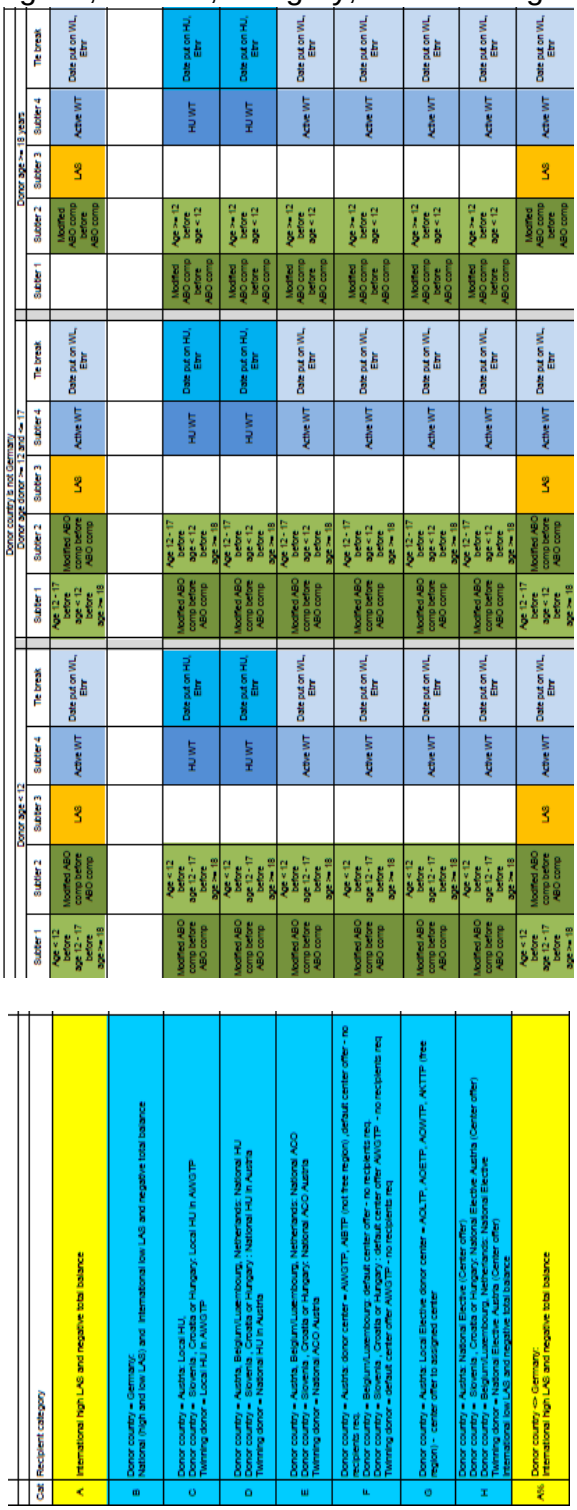
then to
The international high LAS patients from countries with a negative total balance with Belgium, and aged under 12 years, and AB0 blood group compatible according to the AB0 compatible scheme, all sorted by descending LAS,

then to:
The international high LAS patients from countries with a negative total balance with Belgium, and aged between 12 and 17 years, and AB0 blood group compatible according to the AB0 compatible scheme, all sorted by descending LAS,

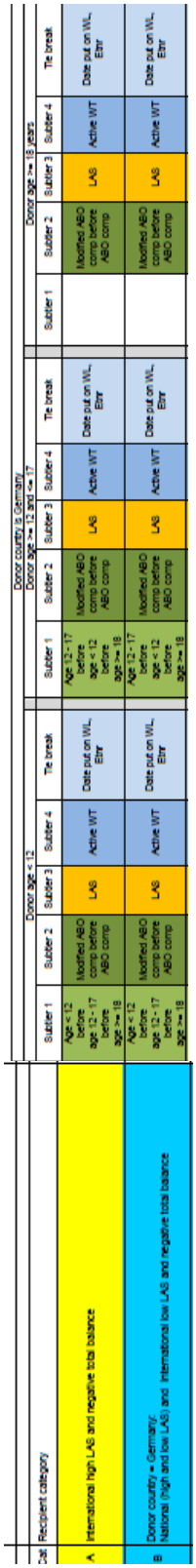
then to
The international high LAS patients from countries with a negative total balance with Belgium, and aged 18 or older, and AB0 blood group compatible according to the AB0 compatible scheme, all sorted by descending LAS,

Etc.

Scheme for Austria, Belgium, Croatia, Hungary, Luxembourg and Slovenia



Scheme for Germany and the Netherlands



Annex 1. Documentation and measurement of the LAS parameters

The data that are submitted to Eurotransplant should reflect the current medical situation and should be documented by a medical report, which should include all the tests necessary for calculating the LAS. These measurements which reflect the current medical situation can be up to 4 weeks old before submission to Eurotransplant in case the LAS < 50 (i.e. low LAS), and can be up to 7 days old in case of a LAS ≥ 50. Exception is made for the **first** listing in the Netherlands, Belgium and Austria where for low LAS patients the data can be up to 6 weeks old. If the clinical situation changes significantly an update of data is required and subsequent submission of these new data is required. A clinical significant change is defined as an initiation or a termination of mechanic ventilation or extracorporeal support, or in case of an increase or a decrease in titrated oxygen requirement of more than 1L/min or an FiO2 > 10%.
Blood gases should be obtained from arterial or arterialized capillary blood samples only. Venous blood samples should not be used for determining the partial pressures.

Recipient height *(cm)*	*LAS-Parameter*
Upon listing the centers are obliged to enter the actual patient's height. Height is important for determining the predicted values and plays a role in the donor organ allocation.	
Documentation: medical reports or accompanying letter or medical records, including pulmonary function test results.	

Recipient weight *(kg)*	*LAS-Parameter*
The recipient weight should be the value measured at the day of the current medical situation. For bedridden patients the last measured weight can be entered. Appropriate scales should be used and the centers should perform plausibility controls in order to check the obtained result. Ambulatory patients do not require being fully undressed; the obtained value for these patients doesn't have to be corrected for the weight of the worn clothes. Weight is used for the determination of the LAS parameters (e.g. BMI).	
Documentation: medical reports or accompanying letter or medical records, including pulmonary function tests	

Date of birth	*LAS-Parameter*
Documentation: medical reports or accompanying letter or medical records	

Diagnosis	*LAS-Parameter*
See attached diagnose list. (Smits has send out request to UNOS for info on homo/heterozygous Alpha-1-antitrypsin deficiency.)	
Documentation: Physician's documentation, histopathology results, imaging, genetic and other laboratory examinations or accompanying letter.	

Assistance level with daily activities	no support	some support	total support	*LAS-Parameter*

An objective scoring system should preferably be used.
No support: ambulatory patients OR WHO performance scale[#] = 0-1 OR Barthel index[ǂ] =100
Some support: for instance patients on the intensive or intermediated care station, OR in whom non-invasive ventilation is needed but without assisted mechanical ventilation or awake ECMO patients OR WHO performance scale= 2-3 OR Barthel index = 50-95
Total support: for instance sedated patient with assisted mechanical ventilation (or sedated while on ECMO) OR WHO performance scale = 4 OR Barthel index <50

Oken M, Creech R, Tormey D, et al. Toxicity and response criteria of the Eastern Cooperative Oncology Group**.** *Am J Clin Oncol.* 1982;5:649-655.

Grade	Explanation of activity
0	Fully active, able to carry on all pre-disease performance without restriction
1	Restricted in physically strenuous activity but ambulatory and able to carry out work of a light or sedentary nature, e.g., light house work, office work
2	Ambulatory and capable of all self-care but unable to carry out any work activities. Up and about more than 50% of waking hours
3	Capable of only limited self-care, confined to bed or chair more than 50% of waking hours
4	Completely disabled. Cannot carry on any self-care. Totally confined to bed or chair
5	Dead

ǂ Mahoney FI, Barthel D. "Functional evaluation: the Barthel Index." Maryland State Medical Journal 1965;14:56-61

Documentation: physician's documentation, nursing documentation

Diabetes	Unknown	Insulin dependent	non insulin dependent	no diabetes	*LAS-Parameter*

The diagnosis of diabetes mellitus and the insulin treatment should reflect the current medical situation. Patient on an intensive care unit who are temporarily treated with insulin should be labelled as 'No diabetes' unless they had a prior diagnosis of diabetes.

Documentation: physician's documentation, accompanying letter

Assisted ventilation	None	CPAP	BiPAP	continuous invasive	intermittent invasive	*LAS-Parameter*

CPAP (continuous positive airway pressure) is non-invasive ventilation without inspiratory pressure adaptation, required during at least 24 hours before the date of LAS actualisation. CPAP treatment for obstructive sleep apnoea syndrome should not be coded as CPAP treatment for the LAS evaluation.
BiPAP (bilevel positive airway pressure) is non-invasive ventilation with inspiratory pressure adaptation, required during at least 24 hours before the date of LAS actualisation. Other non-invasive therapies with pressure support for lung diseases (e.g. pressure support ventilation) shall be classified as BiPAP. BiPAP as therapy for sleep apnoea syndrome should not be coded as BiPAP treatment for the LAS evaluation.
Intermittent invasive ventilation is a situation where in the ventilation protocol clinically significant episodes of spontaneous breathing or episodes of low pressure support (this means less than 12 cmH2O above PEEP level) are documented during at least 24 hours before the date of the LAS actualisation. Long-term tracheotomy patients with out-of hospital ventilation should also be classified as intermittent invasive ventilation.
Patients with continuous mechanical ventilation have no documented spontaneous breathing episodes or episodes with lower pressure support in their ventilation protocol during at least 24 hours before the date of the LAS actualisation.
At the end of the ventilation support a new evaluation of the LAS must be submitted to Eurotransplant. This re-evaluation should encompass a renewed oxygen titration.

Documentation: Medical report with indication for ventilation, including the parameters position of the ventilator, patient chart, ventilation protocol.

Supplemental oxygen	None	at rest	at night	during exercise	*LAS-Parameter*

Oxygen treatment during the last 24 hours before evaluation and submission of the current medical situation must be used. The condition '*Supplemental oxygen at rest*' is valid when the patient is more than 12 hours a day on oxygen support. Shorter periods of oxygen administration shall be labelled as 'Supplemental o*xygen during exercise'* or 'Supplemental o*xygen at night',* in case oxygen is only administered during exercise or at night.
In case the titrated oxygen shows a result of 0 L/min, the label '*Supplemental oxygen at rest'* can be used, but only in case in daily life, the patient is on oxygen support for more than 12 hours a day and this at least 24 hours before LAS evaluation. Also in case the titration results indicate the need for long term oxygen therapy ($pO2 \leq$ 55 mmHg), the label '*Supplemental oxygen at rest*' should be entered.
The amount of oxygen supply needed in daily life at rest and during exercise for ambulatory patients must be documented. This documentation should be done by medical reports, therapy schemes, patient charts with denoting of the precise amount of oxygen administered. For patients in the ward the oxygen therapy should regularly be checked by pulse-oximetry measurements. Exact oxygen flow rates (and no ranges) should be provided when using pulse-oximetry. Note that the measurements can deviate among the reading devices; this should be taken in consideration.

Documentation: Medical reports, physician's documentation, patient charts

Oxygen requirement at rest *(Flow rate in l/min or oxygen concentration in %)*	*LAS-Parameter*

This is the **titrated** oxygen requirement in rest, which is needed in order to obtain oxygen partial pressure (p_aO_2) of at least 60 mmHg. The oxygen supply rate under conditions of exercise or at night is **not** to be entered. (see parameter Supplemental oxygen)
This parameter should be updated with every actualisation of the LAS. In case the p_aO_2 is larger than 60 mmHg (or 8 kPa) in a resting condition without additional oxygen, the value 0 l/min or 21% should be entered.
The centers should not convert the titrated amount of oxygen concentration from % into liter or vice versa themselves but enter the amount given by the machine.
For ambulatory patients the minimal amount of oxygen flow lies at 0,5 L/min, in case lower values are titrated, the value 0 should be entered; values higher than 0,5 L/min should be entered without decimals. In case oxygen fraction is used, the amounts should be entered in 10% steps, except the minimal titrated number of 25%. In case lower concentrations are measured 21% should be entered.
Patients might receive higher oxygen than the titrated values denote (e.g. in case of high flow nasal cannula therapy). In that case the titrated value should be entered for the LAS evaluation.
The centers should have a SOP (standard operating procedure) in place on how to determine blood gas values.
High-flow nasal cannula therapy (HFNC) is defined as an oxygen therapy with a flow rate above 15 L/min. In case of HFNC therapy additional documentation of oxygen titration under conventional conditions of a flow rate of 15L/min should be provided (see below). If the pO_2 is below 60 mmHg under this flow rate of 15 L/min then the patient should be titrated with high-flow oxygen, where titrate pulse oximeter target saturation (S_pO_2) is targeted between 90 and 92%.
In case of high-flow oxygen administration, the value of oxygen concentration (in %) as provided by the machine should be given.
HFNC should not be coded as non-invasive ventilation (BiPAP or CPAP). In case of HFNC **and** BiPAP or CPAP on the same day of the LAS evaluation, oxygen titration will be performed under conditions of BiPAP/CPAP and the corresponding blood gas analyses (ABG) will be entered. In these cases BiPAP or CPAP should be entered for the LAS evaluation (see above).
For patients on extracorporeal support, BGA and oxygen titration obtained before extracorporeal support can be entered. Weaning attempts as well as the current oxygen supply and carbon dioxide partial pressure (p_aCO_2) should be documented.

Recommendations for oxygen titration

Titration has proven to be successful according to the following procedure:

- Only blood gas levels from arterial blood samples or arterialised capillary blood are to be used for the monitoring of the oxygen flow rate
- Blood gas levels used for the evaluation of the patient needed for the LAS should be taken only after the patient has had a minimum of 15 minutes' rest before sampling
- In case of capillary samples are used there should be at least 10 minutes of induction of hyperaemia of the earlobe (arterialisation) before sampling
- A minimum of 5 minutes of constant oxygen flow rate before sampling
- In order to determine the time of the blood gas analysis, the transcutaneous measurement of the oxygen saturation by means of pulse oximetry (S_pO_2) should be used and the oxygen flow should be titrated to a S_pO_2 of 90–92%; subsequently, this must be objectified using a BGA with a p_aO_2 of $\geq$ 60 mmHg
- First, use the amount of oxygen set by the patient (when reading the oxygen flow meter, please observe the device's indication of the oxygen flow, generally the 'North Pole' position of the sphere of the flow meter is used)

- The oxygen flow meter should have an accuracy with a variance of ±10% of the readings in the flow range between 0 and 15 l/min
- Patient-owned oxygen devices and those with an on- demand valve should **not** be used for the titration .
- Use a calibrated pulse oximeter (in the hospital, a standardised pulse oximeter is recommended)
- Titrate pulse oximeter target saturation (S_pO_2) between 90 and 92%; titration only to round oxygen flowrates with the exception of the minimum flow rate of 0.5 l/min (accordingly: 0.5; 1; 2; 3; 4; …; 15 l/min or 25; 30; 35; 40; 50; …; 100%).
- Subsequently, determine the blood gas levels by blood sampling
- Note down the last oxygen saturation and oxygen flow rate or concentration respectively on printout after titration (if possible, no handwritten additions)
- Plausibility check of the values found, if applicable repeated measurement: in case of p_aO_2 values of 60 mmHg and lower, or 80 mmHg and higher
- For mechanically ventilated patients, record the ventilatory status and, if applicable, the ventilatory mode in the blood gas report

Documentation: arterial or capillary BGA report

Forced Vital Capacity (FVC) / **Forced expiratory volume in 1 second (FEV1)[1]** (in % predicted)	*LAS-Parameter/* LASplus-Parameter

A standard operating procedure (SOP) on spirometry should be established by the centers. At each new LAS evaluation the spirometric data should be actualized.
According to the ATS/ ERS guidelines for spirometry, the patient should breathe out maximally after a few relaxed breaths, which is then followed by maximum inhalation, and a subsequent forced and deep expiration. In addition to the FVC and FEV1, the inspiratory vital capacity (IVC) can be determined. From experience, however, this is higher than the FVC and should only be used in case of the unavailability of the FVC. (Miller et al.: Standardisation of spirometry; ATS/ ERS task force; Eur Respir J 2005; 26: 319–338)

The measurement should be carried out a minimum of 3 and a maximum of 8 times. Faulty measurements are to be discarded. The difference between the 2 best FEV1 values should not be higher than 150 ml (100 ml for a vital capacity < 1.0 l). The same applies to the 2 best FVC values. If fewer than 3 measurements can be executed this should be reported in the result.
The maximum expiratory flow rates are determined from the best flow-volume curve, i.e. from the one with the largest sum of FEV1 and FVC. It is still possible to use the nominal values of the European Coal and Steel Community (ECSC) as long as the new standard values of the 2012 Global Lung Initiative (GLI) have not been implemented in the current software of the pulmonary function devices.
In patients with pneumothorax and thoracic drainage may, in individual cases, a spirometry be performed. Lower values are to be expected, and possibly, fewer than 3 measurements can be executed. In case of pneumothorax without drainage, the last measured FVC can be used. If no FVC is available the field is left empty and the default value is used.
With intubated patients or those on continuous non-invasive ventilation and/or undergoing extracorporeal procedures, the last-measured FVC independent of the date of determination can be used. In other cases where no spirometry can be executed (such as intensive care, continuous non-invasive ventilation (NIV), pneumothorax, untreatable coughing) the last available and usable FVC can likewise be used. If no FVC is available the field is left empty and then the default value (150%) is used.

Documentation: Medical reports and medical records

***Systolic/mean*/diastolic *pulmonary arterial pressure, pulmonary capillary wedge pressure*, central venous pressure[1]** (mmHg)	*LAS-Parameter/* LASplus-Parameter

The following parameters should be established during a right heart catheterisation (RHC):
- Central venous pressure/right atrial pressure (mean pressure)
- Pulmonary arterial pressure (systolic, diastolic, mean pressure)
- Pulmonary capillary wedge pressure (PCWP, as mean pressure insofar as technically possible)
- Cardiac output (CO, thermodilution or Fick's method with measurement of O_2-absorption, tabular O_2-absorption not sufficiently reliable), calculation of cardiac index by CO/body surface area

-Mixed venous oxygen saturation

The default value in the absence of a measurement value, which Eurotransplant uses for the LAS calculation, is to be taken from the Eurotransplant manual Chapter 6.

A right heart catheterisation is not indicated for all patients as this invasive examination can endanger a patient in certain circumstances. If there are no medical grounds to suspect pulmonary hypertension in the echocardiogram an RHC may not be indicated and default values will be used. All available measurement values of the catheterisation are to be entered into the LAS entry form of Eurotransplant. For the LAS evaluation **only measurements made at rest** should be used. The measurements need **not** be repeated after listing on the waiting list. The date of the RHC and the measurement values that were used for the LAS evaluation must be entered, if applicable, the LAS review board should be contacted for advice. Eurotransplant ensures that, for the entering of the values, plausibility checks are provided and that in such a situation warning messages are displayed for the person entering the data.
RHC should be collected no earlier than 1 year before first data submission. If there are clinical, echocardiographic or laboratory-chemical indications of haemodynamic deterioration (e.g. brain natriuretic peptide (BNP), the examination should be repeated in order to correctly portray the status of the waiting list patient.
In the case of non-plausible values for the mean pulmonary capillary wedge pressure (e.g. PCWP over 20 mmHg and PCWP higher than or equal to the mean pulmonary arterial pressure), the field should be left empty and the default value is thus to be used.

Documentation: Medical reports and medical records

Carbon dioxide partial pressure[1] (p_aCO_2) *(mmHg)* (Arterial p_aCO_2: current p_aCO_2)	*LAS-Parameter*

Only blood gas levels from arterial samples or arterialised capillary blood should be used. The p_aCO_2 should only be established from blood gas results with oxygen titration.

Documentation: Medical records

Maximum and minimum carbon dioxide partial pressure (p_aCO_2) *(mmHg)* (Arterial p_aCO_2: highest and lowest p_aCO_2)	*LAS-Parameter*

In order to establish the disease progression, only blood gas values that were established at rest from arterial samples or arterialised capillary blood in the last 3 months before the LAS evaluation should be taken into account. The p_aCO_2 should only be used from blood gas results that were used for oxygen titration. Night-time, venous, transcutaneous measurements or measurements during exercise or during sleep of pCO2 are not acceptable for the LAS calculation.
If the clinical urgency indicated by the LAS evaluation is not adequately reflected without taking the blood gas values into account, an eLAS request can be considered.

Documentation: Medical records, medical reports

Carbon dioxide partial pressure, increase *(%)*	*LAS-Parameter*

Automatic calculation by Eurotransplant

6-Minutes-Walktest (6MWT) *(m)*	*LAS-Parameter*

The centres are obliged to establish a written standard operating procedure (SOP) according to ATS/ERS criteria with respect to the 6MWT and should perform a new measurement for each LAS evaluation.
If the patient requires oxygen during exercise **the oxygen during the 6MWT must be administered at the prescribed flowrate** so as not to endanger the patient. Tools (walking aids) should, if indicated, be used. However, doing the test using a wheelchair is not sensible. A continuous measurement of the oxygen saturation measured using pulse oximetry is recommended.
The walking distance that was covered in the 6 minutes, including any breaks, should be documented. Reasons to interrupt the walk are:

- Angina pectoris
- Unbearable breathlessness
- Unbearable leg pain
- Staggering with the risk of falling
- Cold sweat with paleness.
- Other reasons are to documented

The reasons for termination, the extent of the breathlessness (e.g. measured using the Borg scale), the O_2 saturation and the heart rate on termination at the end of the examination, as well as the minimal O_2 saturation during exercise are to be documented.
A 6-minute walk distance of "0" m is only registered for patients on extracorporeal support or on assisted mechanical ventilation. In other cases in which no 6MWT can be done (e.g. on orthopaedic grounds), the most

recent 6-minute walk distance should be used, or otherwise the default value of 46 m is used by default. This must be justified by the centre in writing.
Documentation: Medical reports, medical records

Creatinine *(mg/dl oder µmol/l)*	*LAS-Parameter*
The most recent available creatinine value (in plasma or serum) of the last 7 days before the LAS evaluation must be submitted.	
Documentation: Lab reports, Medical records, Medical reports	

Intubation date	LASplus-Parameter
For intubated patients, the date of the intubation or tracheotomy (whichever was earlier) must be indicated. When the patient is extubated or decannulated the field is to be left empty for notification to Eurotransplant. Intubated or tracheotomised patients who were spontaneously breathing during the last 24 hours before LAS evaluation should not be indicated as ventilated. Upon termination of the ventilation, a follow-up notification must be sent. This also includes a new oxygen titration.	
Documentation: Medical reports, medical records, accompanying letter	

Oxygen partial pressure (p_aO_2) (mmHg)	LASplus-Parameter
The current p_aO_2 from the blood gas result of the oxygen titration should be used. Only blood gas levels from arterial samples or arterialised capillary blood that were taken at rest should be used.	
Documentation : Medical reports	

Standard bicarbonate (mmol/l) and **pH**	LASplus-Parameter
The current pH and the standard bicarbonate from the blood gas result of the oxygen titration should be used. Only blood gas levels from arterial samples or arterialised capillary blood that were taken at rest should be used.	
Documentation : Medical reports	

Cardiac index[1] (CI) (l/min/m^2)	LASplus-Parameter
The cardiac index is established by means of resting RHC and is calculated by dividing the cardiac output by the body surface area. In case of a CI < 2 l/min/m^2 and a primary diagnosis of pulmonary arterial hypertension, the necessity of a eLAS request should be investigated.	
Documentation: Medical reports, medical records	

Haemoptysis	yes	No	LASplus-Parameter
This is haemoptysis with a bronchial artery embolisation within the last 3 months before LAS evaluation.			
Documentation: Medical reports or accompanying letter or medical records			

Infection	yes	no	LASplus-Parameter
The occurrence of a pulmonary infection that was treated with intravenous antibiotics or antifungus medication within the last 24 hours before the LAS evaluation.			
Documentation: Medical reports or accompanying letter or medical records			

i. v.- vasopressors (medication: vasopressors)	yes	no	LASplus-Parameter
Current intravenous therapy with vasopressors (e.g. noradrenaline, adrenaline, vasopressin) at the time of the LAS evaluation.			
Documentation: Medical reports or accompanying letter or medical records			

IV Inotropes	yes	No	LASplus-Parameter
Current therapy with intravenous inotropes (e.g. dopamine, dobutamine, PDE inhibitors) at the time of the LAS evaluation.			
Documentation: Medical reports or accompanying letter or medical records			

IV Prostanoids	yes	no	LASplus-Parameter
Current systemic (intravenous, subcutaneous) therapy with e.g. epoprostenol, treprostinil or ilomedin at the time of the LAS evaluation.			
Documentation: Medical reports or medical records			

Maximum und minimum creatinine (mg/dl oder µmol/l))	LASplus-Parameter
The highest and lowest creatinine values (in plasma or serum) of the last 3 months before the LAS evaluation should be submitted.	
Documentation: Medical reports or medical records	

Total-Bilirubin[1] (mg/dl oder µmol/l)	LASplus-Parameter
The most recent available laboratory value from plasma samples should be submitted.	
Documentation: Medical reports or medical records	

Maximum and minimum bilirubin[1] (mg/dl or µmol/l))	LASplus-Parameter
The highest and lowest bilirubin values (in plasma or serum) of the last 3 months before LAS evaluation should be submitted.	
Documentation: Medical reports or medical records	

Platelets (Thousands/µl)	LASplus-Parameter
The most recent available laboratory value before LAS evaluation must be submitted. Interfering factors such as pseudo-thrombocytopenia are, where relevant, to be eliminated by assaying citrated blood.	
Documentation: Medical reports or medical records	

International normalised ratio (INR)	LASplus-Parameter
The most recent available laboratory value before LAS evaluation must be submitted.	
Documentation: Medical reports or medical records	

C-reactive Protein (CRP) (mg/dl)	LASplus-Parameter
The most recent available laboratory value (in plasma or serum) before LAS evaluation must be submitted. .	
Documentation: Medical records	

Minimal oxygen saturation during the 6-minute walk tests (6MWT) (%)			LASplus-Parameter
The minimal oxygen saturation during the most recent 6MWT for the LAS evaluation must be submitted.			
Documentation: Medical reports or medical records			
Pneumothorax with drainage	yes	no	LASplus-Parameter
Current therapy of a pneumothorax with thoracic drainage at the time of the LAS evaluation.			
Documentation: result of imaging techniques, patient charts, doctor's records			

Extracorporeal support	none	interventional lung assist or $ECCO_2$-R	veno-venous ECMO with one cannula	veno-venous ECMO with two cannulas	veno-arterial or veno-venous arterial ECMO	pulmonal-arterial and left-atrial System (PALA)	LASplus-Parameter
$ECCO_2$ removal systems are e.g. interventional Lung Assist (iLA), iLAactive (Novalung), Pump Assisted Lung Protection (PALP, Maquet), Hemolung (Alung), Decap (Hemodec). These systems typically have a blood flow of less than 1.5 l/min. For patients who, at the time of the LAS evaluation are undergoing extracorporeal procedures, the most recent blood gas analysis, the most recent oxygen requirement and the ventilation status **before** the start of the extracorporeal procedure are to be used for the first notification. In this particular case, the usual timeline for the parameters that were derived from the BGA (p_aCO_2, p_aO_2, HCO_3^-, pH) do not apply. For all other parameters, the current values are to be indicated. This also applies if the p_aCO_2 under ongoing ECMO is the minimal p_aCO_2. As of the 7th day following a follow-up notification with respect to an extracorporeal procedure, the current blood gas values, oxygen requirement and ventilation status are to be used to adequately reflect a further deterioration of the patient. If it is clinically justifiable, the blood gases and titrated oxygen requirement can be established while reducing the extracorporeal procedure. Weaning attempts with respect to an extracorporeal procedure are to be documented. If the clinical urgency is not adequately reflected by the LAS value, the option of submitting an eLAS request should be discussed. Upon termination of the extracorporeal procedure, a follow-up notification has to be executed. Under no circumstances should the gas flow or the oxygen quantity in respect of the extracorporeal procedure be entered in the ET form instead of the oxygen requirement (see above).							
Documentation: Medical reports or medical records, ECMO report, result of imaging techniques, OP report, doctor's letter							

Date of start Extracorporeal support	LASplus-Parameter
The date of the initial cannulation or data of start ECMO support is to be indicated (whichever came first). When the patient is decannulated from the extracorporeal system, the field in the ET form is to be left empty once again. In that case, current health status should be assessed immediately and a notification of the parameters for the LAS must be sent to Eurotransplant straightaway. Date of first cannulation or date of ECMO support (whichever came first) should be entered. When the patient is off ECMO support the LAS data should be renewed.	
Documentation: Medical reports, medical records, protocol from the operation, ventilation or ECMO protocol	

Exacerbations (Number)	LASplus-Parameter
The number of exacerbations (infections or worsening of the clinical condition) that required hospitalisation during the last 12 months before the evaluation of the LAS, including the current exacerbation, should be entered. Hospitalisation for elective interventions shall not be counted.	
Documentation: Medical reports or medical records or accompanying letter	

Renal replacement therapy	Yes	no	LASplus-Parameter
Renal replacement therapy (e.g. dialysis or haemofiltration or combinations of these both) required during at least 7 days before actualisation of LAS should be entered.			
Documentation: medical report or medical records			

Treatment at intensive care unit	Yes	no	LASplus-Parameter
The current medical situation of the patient must be entered. An intensive care unit is defined as a unit where 24/7 a physician with experience in intensive care medicine is present. In addition, usually one nurse for two ICU beds is present during each shift. An intensive care unit treatment requires 24 hours patient monitoring of cardiovascular and respiratory parameters and has the possibility of assisted mechanical ventilation and/or extracorporeal support			
Documentation: medical records			

Treatment at intermediate care unit	Yes	no	LASplus-Parameter
The current medical situation of the patient must be entered. An intermediate care unit treatment requires 24 hours patient monitoring of cardiovascular and respiratory parameters and has the possibility of non-invasive ventilation.			
Documentation: medical records			

Combined organ transplantation	Yes	No	LASplus-Parameter
The patient is simultaneous registered on the lung and a non-thoracic waiting list (liver, kidney, pancreas, intestines).			
Documentation: Registration data at Eurotransplant			

Clinical Frailty Scale (Rockwood)	Values 1- 7	Unknown	LASplus-Parameter
The current medical situation of the patient has to be entered. Clinical Frailty Scale. 1 Very Fit – People who are robust, active, energetic and motivated. These people commonly exercise regularly. They are among the fittest for their age. 2 Well – People who have no active disease symptoms but are less fit than category 1. Often, they exercise or are very active occasionally, e.g. seasonally. 3 Managing Well – People whose medical problems are well controlled, but are not regularly active beyond routine walking. 4 Vulnerable – While not dependent on others for daily help, often symptoms limit activities. A common complaint is being “slowed up”, and/or being tired during the day. 5 Mildly Frail – These people often have more evident slowing, and need help in high order instrumental activities of daily living (IADLs) (finances, transportation, heavy housework, medications). Typically, mild frailty progressively impairs shopping and walking outside alone, meal preparation and housework. 6 Moderately Frail – People need help with all outside activities and with keeping house. Inside, they often have problems with stairs and need help with bathing and might need minimal assistance (cuing, standby) with dressing. 7 Severely Frail – Completely dependent for personal care, from whatever cause (physical or cognitive). Even so, they seem stable and not at high risk of dying (within ~ 6 months). K. Rockwood et al. A global clinical measure of fitness and frailty in elderly people. CMAJ 2005;173:489-495			
Documentation: Medical records			