WP 4 'Living Donor Registries'

FINAL REPORT

Including Project Recommendations

European Commission

Accord
Achieving Comprehensive Coordination in Organ Donation

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1. Executive Summary

1.1 Introduction

An increasing number of people worldwide decide to donate a kidney or a part of their liver by life. In order to inform potential living donors properly about the consequences of living donation, research is necessary. Research can lead to new insights and developments in the field of (living) donation. Especially the long term safety and possible health risks of living donation for the donor are issues that need further analyses. A Registry of Registries (RoR) can help to gain those important insights, by the collection of living donor follow-up data in a(n inter)national database. This report describes the activities that were realized during the ACCORD Work Package 4 project, including the design of the RoR and a pilot phase.

1.2 Objective of ACCORD WP4

ACCORD is an abbreviation of 'Achieving Comprehensive Coordination in ORgan Donation'. This project is initiated by the European Commission to strengthen the full potential of EU Member States (MS) in the field of organ donation and transplantation. The objective of WP4 of the ACCORD project is 'to improve MS information systems on live organ donation through the provision of recommendations on the design and management of structured live donor registries and through setting down a model for supranational data sharing'.

Living donors mostly donate a kidney, but donation of a part of the liver, or a lung is also possible. The numbers of donors who donated a lung is too small to organize a well-established follow-up database. In the ACCORD project the focus will be on follow-up of donors, who donated a kidney or a part of the liver.

1.3 Background of the project

Donor organ shortage is a major problem for patients within the European Union (EU), resulting in a long waiting time for organ transplantation. In addition to transplantation with a graft from a deceased donor, living donor organ transplantation is an option. Living donor organ transplantation has advantages above deceased donor organ transplantation, for example for the graft and patient survival and for the waiting time of the recipient. Besides the successes of transplantation with an organ from a living donor for the recipients, there is also a major disadvantage. Donors are healthy persons, who will undergo surgery, which is not necessary for their own health. Since the beginning of living donor programs, there has been concern about the long-term consequences for the donor.

The number of transplantations with a kidney from a living donor is increasing within the EU. This is a result of new national living donor programs, but also of expanded selection criteria for living donors. Not only perfectly healthy donors are elected, but donors with health problems, for instance with moderate hypertension, or with a previous heart disease, are accepted as well. The outcome of health on the long run of these donors is yet unknown. To answer the abovementioned questions a good follow-up system is required. Countries are obliged to have a follow-up system for living donors, as stated in the EU Directive 2010/53/EU 'on standards of quality and safety of human organs intended for transplantation'. Such a follow-up system should be accurate,

well maintained and above all should contain sufficient data. Some countries don't have a living donor follow-up system yet. An active international registry to establish a large database is lacking as well.

1.4 Current experience

There is a wide variation among the EU member states (MS) in the experience with living donation and living donor follow-up. To collect detailed information about the experience with living donation and living donor follow-up among the WP4 partners, a questionnaire was prepared. A total of 13 partners completed and returned the questionnaire. Every respondent has experience with living kidney donation; some also mentioned experience with living liver donation. Nine respondents already collect their data in a digital registry, some of whom just started recently, others mainly between 2000 and 2005. The number of hospitals or transplant centres in the MS that share their data in a digital registry varies from 1 to 53. The number of donors included in the registries differs from 22 up to 11761 donors. Most of the partners, 7 in total, have a registry performing on Oracle applications, and some on an Oracle product combined with another system, for example Access or SQL server.

A part of the questionnaire was dedicated to the collection of items that were used by the partners both for a follow-up system of the kidney donor as well as the liver donor. Also included in the questionnaire was the question, which items were not collected at this moment, but should be nice to have in a future RoR. All items together were the basis for the discussions about items in the future RoR, as is explained in chapter 5 and 6 of this report.

1.5 Data set and data dictionary

The results from the abovementioned questionnaire were used to define a common data set. It is the intention to collect as many items as possible, but also to achieve a high completeness rate. These goals can contradict each other however. The more items are defined, the greater the challenge to complete all items. A distinction is made between a data set for a national registry and a data set for the international RoR, since some items might be necessary for a national registry, but are not important at all for international data sharing. A limited number of items for four databases were defined: follow-up for the living kidney donor both national and international and a follow-up database for the living liver donor, also national and international.

1.6 Technical requirements of follow-up registry

After defining the items with definitions the next topic was the technical requirements of the follow-up registry. The current techniques that are used within the MS to collect data vary, as expected. Cooperation between different countries with different standards, different experience but also different budgets emphasises the need for a clear description of the technical design of a living donor follow-up registry. The new RoR should be designed using the currently available technology. This results in the recommendation to build an European RoR by creating a web based relational database. The webpage as well as the web-based database should be approachable

by the most common internet surfing programmes. The language used for both the web-based database and the website will be English. In this web-based database it should be possible to enter data either directly by key entry or by file upload from national registries. An important feature of the web-based database is that data from the RoR will be available for the Competent Authorities (CA) of a country at all times. The minimum technical requirement for the availability of the data is a download possibility. Apart from this download facility, standard (fixed) reports should also be available.

1.7 Governance of a RoR

Different people are involved in the RoR. First of all, the people from the donor centres who complete the data, either in their own local database, in their national database or directly by key entry in the RoR. Secondly, the people that are responsible for the data entry in the national database, but also for the upload of the national data into the RoR. They will also be responsible for the authorisation of people for the RoR in their own country. Thirdly, people working directly with the RoR, who are responsible for the daily routine (further referred to as 'RoR staff members'). Fourthly, there should be a body that is responsible for the overall management of the RoR, including also the responsibilities for major decisions concerning the RoR. All participating MS should be represented in this body (further referred to as 'Assembly'). To make things more practical, a fifth group should be defined, which is a small group with the direct daily supervision of the RoR (further referred to as 'steering committee').

1.7.1 RoR staff members

For the entire task of daily support and (functional) application management it is expected that three employees are necessary. One employee is responsible for data management and functional application management, one for bio-statistical analysis and one for secretary work. These three functions are not full time equivalents. An ICT developer can be hired when necessary (subcontracting). The functional application manager plays a role in optimising the registry. Suggestions for improvements can come from (daily) contact with users, but also from formal national representatives or CA's. The steering committee is the body that decides whether such a change in the system is allowed. Besides taking care of the database, also a website has to be built and maintained. An important part of the website will be the reports, which will be renewed every year. The functional application manager is also responsible for the management of user names and passwords.

1.7.2 Assembly

Due to the complexity of the registry and the fact that many MS are involved, it is necessary to have tasks and responsibilities appointed to an Assembly. In the Assembly all countries that participate in the RoR should be represented. The main tasks of the Assembly are: the appointment of the members of the steering committee and the governance of the steering committee. Important decisions concerning the structure of the RoR, the items in the RoR with their definitions will be the responsibility of the steering committee, but the Assembly will check all these activities and judge whether the policies of the RoR are carried out correctly. All MS that participate in the RoR will depute one representative. The Chairman of the Assembly needs to have a broad understanding of clinical, technical and regulatory issues. The independent Chairman is appointed by the CA committee. This way, the Assembly is firmly linked to the CA.

1.7.3 Steering committee

The Assembly is quite large and only meets yearly which makes it difficult to take easy and fast decisions. A smaller group from the Assembly will be appointed to form the steering committee. The steering committee is responsible for reviewing (and granting) requests for data or non-standardised reports. The steering committee keeps close contact with the RoR staff members. The steering committee will meet in person preferably three times a year, and consists of 5 people, chosen from the Assembly. The steering committee includes 4 members involved in living kidney donations and 1 in living liver donation. The composition of the steering committee will rotate every three years on a rolling basis.

1.7.4 Host company

The RoR is too small to be a self-supporting organisation. Therefore the RoR is preferably hosted in an already existing organisation, which is familiar with transplantation and/or donation and has several possibilities for data management. The host company should also have all functionalities and applications for security control and back-up systems. The steering committee remains responsible for the RoR staff members, but can delegate the practical responsibility for working conditions, wages, et cetera to the host company.

1.8 Ownership of the data and data requests

The donor centres are the primary owners of the data. Therefore, requests for an extract of their 'own' data from a national registry by a donor centre should be granted without restriction. It is a greater challenge to set rules for requests for data from the RoR from individual centres, MS or organisations. It is recommended to distinguish three categories of requests in the RoR:

1. The first type of request is for data that are simple and should be made available for the greater public. These data are always general data, for example the number of donors in 2013 in Europe, how many of these are women, et cetera. Most of these data will also be available via standard (fixed) reports on the website of the RoR.
2. The second type of request is for data (mostly by one of the participating countries), not only from their own country, but also for data from more (or all) countries. It is essential that with this type of requests individual countries (or patients) cannot be identified and the data are anonymized. All requests of this type should be considered by the steering committee.
3. The third type of request is for data which can lead to the identification of countries and/or individual donors. In principle it should not even be possible at all to identify an individual donor, since the data in the registry is collected anonymously, but the countries' names are collected and the steering committee must identify such a request. In case of a request of this type, all countries that can be recognised should be asked for permission to deliver these data. In the extreme rare case of one or more identifiable donors the donor country should also be asked for permission.

The abovementioned categorization is also applicable for setting up a national registry. In case of a national registry, the sensitivity on centre and individual donor recognition is even greater and should be taken into account very carefully.

1.9 Financial aspects

Financing a project as described above is a real challenge. To start up a RoR, but also to ensure a sustainable RoR, money is essential. To probe the opinion of the participating countries about financing possibilities and also their willingness to participate in a future RoR, a survey was sent out in January 2015. The questionnaire was sent to 15 countries. The majority was interested to join a future RoR, were willing to adapt their already existing database, and were in favour of a financing system in the starting years by an EU fund. Two organisations indicated that they wanted to host a future RoR. Decisions about a future RoR, a financing system, and hosting have to be taken by the Competent Authorities of the participating countries and by the EU.

1.10 The pilot

Part of the ACCORD WP4 was to test the recommendations that were developed during the project by performing a pilot phase. Tested in the pilot are the dataset and data dictionary (chapter 6) as well as the technical specifications (chapter 7). The pilot can be seen as a proof of concept. The recommendations concluded from the project and the pilot are listed in paragraph 1.11.

1.10.1 Design of the pilot

The specifications for this pilot were:

- Complete ACCORD data set and data definitions – KIDNEY only
- Donors who donated a kidney in 2010 and 2011 were included
- Only 1 year follow-up could be registered
- Relational database
- Web-based application
- Approachable by common Internet surfing programs
- Official language: English
- Direct data entry possibility
- File upload possibility (from national databases)
- Data download possibility

Time and money were limiting factors in setting up the pilot registry. Hospital Clinic of Barcelona already had a registry structure in place that would fit for the ACCORD pilot as well, within the given budget. It was therefore decided to perform the pilot in close cooperation with the Hospital Clinic of Barcelona. Data protection, but also technical support was supplied by Hospital Clinic of Barcelona. The ACCORD consortium, more specifically, the countries that participated in the pilot, are the owner of the data. The Dutch Transplant Foundation was responsible for performing the analysis.

1.10.2 Evaluation of the data

Number of donors included in the ACCORD pilot registry according to country

Country	Number of donors	Percentage of the total number of donors included	% of expected*
Spain	343	11.8	62.1
United Kingdom	2049	70.4	99.8
Croatia	15	0.5	51.7
Lithuania	11	0.4	100
Latvia	5	0.2	100
The Netherlands	337	11.6	36.9
Poland	90	3.1	100
Portugal	39	1.3	39.8
Slovak Republic	20	0.7	100
Total	**2909**	**100**	

** Based on the total number of living donors as reported in the Newsletter Transplant 2011 and 2012*

The entry of donors, either by key entry or by file upload did technically not give many problems. The upload module had a limitation for the number of donors that could be included in one time, which resulted in a loss of donors from the Netherlands (see also paragraph 1.10.2). The incompleteness of the national or local databases was another important reason for the reported low number of included donors.

Although the items in the different countries were the same, several definitions were not. The conversion of data from an existing database into the ACCORD format proved to be very time-consuming. The consequence of this was that not all items were filled out in the proper predefined ACCORD items. The pilot shows that a central registration is absolutely necessary. An alternative could be to send national data to a central European database periodically (for instance once every three years), to perform analyses. The pilot shows that with the current national databases that is impossible. This would only be an option if all countries use exactly the same items and the same definitions in their national databases.

With this pilot it is impossible to draw any conclusion about the long-term consequences of living donation, since only one-year follow-up data is included. From the data that were collected in the ACCORD pilot registry, we can learn that no severe early complications were reported, with a few exceptions (splenectomy, bowel injury). Two deaths were reported, but these were not related to the kidney donation procedure. No donors needed renal replacement therapy after donation. Donors returned to their previous activity level within 3 months and without facing large problems after donating one of their kidneys.

1.10.3 Practical and technical evaluation of the pilot

Many different aspects were tested and evaluated.
The outcome of the practical and technical evaluations were:

- The ACCORD WP4 pilot registry is a suitable way to collect living donor follow-up information.
- Direct data entry and file upload are both good possibilities to enter data into the registry.
- The size of the upload file (number of records to be uploaded at once) was limited due to a technical setting in the application. This caused a lot of confusion and fewer donors were included as a result of this setting. This problem is easy to solve.
- The headings in the upload template are not easily identified, because numbers are used as a reference instead of the column title.
- The file upload file for uploading data from an existing registry had a predefined template, which was easy to use. Conversion had to take place of items from existing registries into items of the ACCORD pilot registry. The countries that participated in the file upload part of the pilot, had difficulties to translate their items and their definitions to the predefined ACCORD items and definitions. This translation proved to be not always possible and when it was possible, it proved to be very time consuming.
- The pilot can be approached by all common browsers, preferably using the latest version. Internet Explorer is less convenient to use, because updates are not installed automatically and could therefore cause difficulties when running the registry.
- The data download functionality worked well and is a good possibility for countries to extract their own data. There was however an issue with the 'decimal separator' in the download file, probably caused by the settings of the local computers. This problem could not be solved during the pilot.
- The installation of a support team that responded to any technical difficulties within a short period of time was very valuable.
- Users responded that they were faced with a lot of missing values in the patient's medical files.

1.11 Recommendations

The results of the project and the experiences with the ACCORD WP4 pilot registry result in the following recommendations:

- A **common** data **set** and data **definitions** are essential for an international registry, enabling (international) data analysis (Chapter 15);
- Appropriate **governance arrangements** should be in place (as detailed in Chapter 8);
- The **new database** for the collection of follow-up data of living donors should be a **web-based application**;
- The web-based application should have the possibility of **direct data entry**;
- Countries with a small number of living donors could use the registry of registries as their **national follow-up registry**, using the direct key entry possibility. It should be taken into account that the data set for a national registry is different from the data set for an international registry, so the country should have the **possibility to collect** the data that is set to be necessary on a **national level**;
- The web-based **application** should have an **upload facility**. The size of the upload file (number of records to be uploaded at once) should not be limited;
- **Standardized conversion** rates from **one value** (from an existing registry) to the future registry value should be available;
- The web-based **application** should have a **download facility**, where data can be extracted easily by participating countries;
- Special attention will be needed for the internet browser program of the user, to assure **all web browsers working correctly** with the web-based application.
- A **support** team should be available and respond **within short period** to support in case of any questions and/or problems;
- The **official language** of the web-based application should be **English**, and also commentary fields should be in English;
- When in the future ACCORD database historical items of national database have to be included, some **mandatory** items should **be made optional** to ensure sufficient upload possibilities. Preferably this change from mandatory to optional is temporarily;
- Several **standard reports** should be **available**;
- It is suggested to add an **explanation** about the background, goal and responsible institution or consortium in the **home-page** of the online application;
- The **registry** as well as the upload template and the reports that can be extracted from the registry should contain **clear headings** and logos and should be **recognizable** as being a product of the future follow-up application;
- Donor **centres** should be **obliged** to collect living donor follow-up data in order to ensure sufficient follow-up;
- A **follow-up registry**, based on the ACCORD recommendations, must be **implemented**. A new EU-project to accomplish this should be initiated.

2. Project Introduction

2.1 Achieving Comprehensive Coordination in ORgan Donation

This report describes the activities and products that result from work package 4 (WP4) of the ACCORD project. ACCORD is an abbreviation of 'Achieving Comprehensive Coordination in Organ Donation'. This project is initiated by the European Commission to strengthen the full potential of European Union (EU) Member States (MS) in the field of organ donation and transplantation, to improve cooperation among them and to contribute to the effective implementation of Directive 2010/53/EU (1) and the Action Plan on Organ Donation and Transplantation (2009-2015): Strengthened Cooperation between MS (2). An effective implementation is to be achieved through the collection, generation and dissemination of information, knowledge, experience and tools on organ donation and transplantation throughout the European countries.

2.2 Objectives and expected outcomes of work package 4

The ACCORD project focused on specific areas which were translated into different work packages. Work package 4 focussed on: 'Developing live donor registries (LDR) and fostering international data sharing on live donation (LD). Elements of innovation were to be introduced through ACCORD in the field of donation and transplantation across the EU, for instance, a very first common basis for the development of live donor registries.' The objective of the Joint Action ACCORD WP4 is 'to support MS in the development of LDR and to foster international data sharing on LD across the EU'.

The expected outcome is summarized in the Technical Annex as follows:
"Recommendations for setting up living donor registries will be provided, facilitating international data sharing, which will provide MS without LD with standards and expected results. LDR will increase the safety of LD programs".

The specific objective (nr. 1) is 'to improve MS information systems on live organ donation through the provision of recommendations on the design and management of structured live donor registries and through setting down a model for supranational data sharing'.

Four milestones are identified to meet the objective:

Nr	Milestone title	Month of achievement	Achieved
1	Description of existing registries	6	✔
2	Definition of a minimum and expanded data set and elaboration of a data dictionary	12	✔
3	Recommendations on governing, operational and technical rules for living donor registries	15	✔
4	Recommendations (piloted) for a registry of registries	34	✔

2.3 Data collection and data exchange

Living donors should be monitored after donation to see whether the donation has resulted in any side-effects, on the short term, but also on the long run. In articles 15.3 and 15.4 of the EU Directive 2010/53/EU (1), the following provisions are set down:

Article 15: Quality and safety aspects of living donation

3. *Member States shall ensure that a register or record of the living donors is kept, in accordance with Union and national provisions on the protection of the personal data and statistical confidentiality.*
4. *Member States shall endeavour to carry out the follow-up of living donors and shall have a system in place in accordance with national provisions, in order to identify, report and manage any event potentially relating to the quality and safety of the donated organ, and hence of the safety of the recipient, as well as any serious adverse reaction in the living donor that may result from the donation.*

In other words, countries need to have a system in place to follow and register the health of living donors. As the next chapter will show, there are differences in the experience with living donation within the EU MS. Some countries have had years of experience with a great number of living donors and have a digital follow-up registry. Others don't have a living donation program at all or have just started with very few donors and have no organised or digitalised follow-up system. The Action Plan (2) promotes 'the exchange of best practices on living donation programmes', through which the Commission intends to help MS to develop adequate tools to facilitate the proper collection of information on the medical, psychological, financial and social consequences of living donation on the short and the long term.

Data collection and data sharing leads to the collection of a large amount of data. The great advantage of exchanging knowledge between different (EU) countries, is that a greater number of patients will be included and different techniques, (national) policies and approaches can be analysed. Analysis on this data will contribute to a better understanding of the impact of living donation on both short- and long-term outcomes for the living donor. This understanding will provide the MS with new insights or can lead to new scientific evidence on the aspect of living donation. All of these results should be used to protect a living donor of the risks related to living donation. Of course, the results of data analysis should also be used to inform future (potential) living donors. This information will help the potential donor in making informed decisions.
The access to so much (inter)national data makes it possible for countries, but also for individual centres, to compare their results with other centres and/or MS. Structural feedback is also an aspect that can help centres and countries to anticipate or influence trends and also to improve clinical practice. Scientific research gives insight into the consequences of (medical) procedures and into the results of different approaches and techniques. The information helps to improve the effectiveness of the corresponding procedure and its safety and quality. Different partners can identify a 'best practice' and learn from this practice's experience. This research may lead to improving the existing programmes and in possible implementation of living donation programmes in MS without a living donor (LD) programme yet.

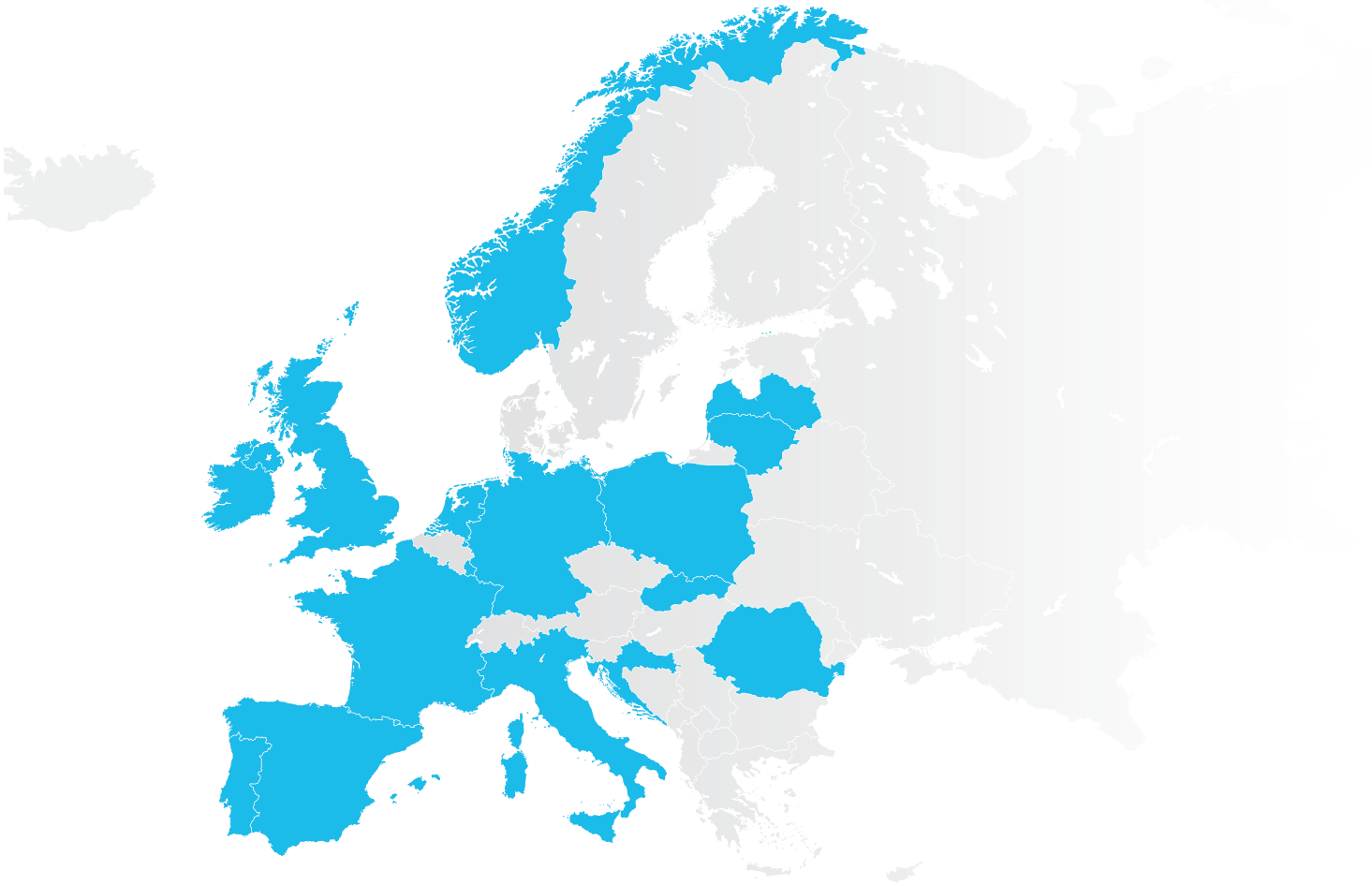
As the general population changes, the profile of living donors changes as well (higher age, higher weight and hypertension are no longer absolute contra-indications). What are the consequences of these changes for donors on the short-term, but particularly on the long-run? Periodic analysis is necessary to keep up with these changes in donor population. There are several possibilities to collect data from different countries. These possibilities vary from an incidental or periodic merge of (national) databases to setting up an international registry of registries (RoR) with a continuous collection of data. Paragraph 9.4 expands on these different possibilities. As part of the defined ACCORD milestones, the project has focused on the concept of an active international European registry, where MS periodically send in their follow-up data of living donors to expand the amount of collected data. WP The objective of ACCORD WP4 is to present a set of recommendations for MS to set up a national Living Donor Registry and to present recommendations for the development of a European Living Donor Registry of Registries (RoR).

2.4 Project participants

Fifteen European MS have cooperated in this work package. The representatives of these MS were medical doctors working in hospitals and staff of national transplant organisations. The working group members were all representing the Competent Authority (CA) of their MS. Besides the EU MS, four collaborating partners were included in WP4. Eurotransplant, Scandiatransplant, Hospital Clinic of Barcelona and Belgium were these collaborating partners. Their experience in international co-operation as well as their experience with the collection of data from different (EU) MS (Eurotransplant and Scandiatransplant) made their contribution most valuable. Previous European projects focusing on international data collection, such as EULID (Hospital Clinic of Barcelona) and EFRETOS (Eurotransplant), made their participation of great importance. Belgium was added to the project group as a result of their request to join the project group after the project had already started. By adding Belgium as collaborating partner, they could benefit from the results of the project, without complex (financial and administrative) structures.

The MS that participated are (in alphabetical order): Croatia, France, Germany, Ireland, Italy, Latvia, Lithuania, Netherlands, Norway, Poland, Portugal, Romania, Slovak Republic, Spain, United Kingdom.

Figure 1. Participating member states in ACCORD WP4



2.5 Beneficiaries

2.5.1 European (transplant) community

The whole European (transplant) community could benefit from a great amount of data from a considerable number of countries. Follow-up data from a large group of donors from different EU countries could lead to different or even new scientific results if compared to studying small groups of living donors in individual countries

2.5.2 National governments of European Member States

A complete set of recommendations for setting up a national follow-up registry is a great document to use for building a national registry. The harmonization of a data set and data definitions makes it easier for EU MS to compare national results with the results of other countries. Countries with very positive scores compared to others could be used as an example.

2.5.3 Medical doctors in (local) centres

Not only the CA's of the EU MS benefit from the results of WP4. Local centres, using the standardized ACCORD data set, are able to compare their results with the average, enabling them to make adjustments in case of unacceptable differences. In case a local centre is the only (living donor) transplant centre in a country, the results of this centre can be seen as the national results. This local centre could also use the RoR as their national living donor follow-up registry, or the recommendations from this present document could be used for setting up a national living donor follow-up registry.

2.5.4 Potential living donors

The results from data comparison and data analysis should be used to inform a potential donor about the possible risks of living donation, about indicators that seem to cause or prevent negative effects, about life-style suggestions before and after donation, et cetera. Living donors are healthy people that are willing to donate a kidney or a part of their liver to improve (or even save) the life of another person. This very altruistic deed should be performed as safe as possible and the living donor should be prepared for any effect that might be caused by the donation as good as possible. Countries that have little experience with the procedure should not have to re-invent the wheel that was already invented by another MS years ago. Countries and centres should learn from each other and should share their experience. All of this to make living donors benefit from the experience and to offer them a safe procedure with minimal risks.

3 Living Donation

3.1 Background

Organ shortage is an issue in every EU MS. MS are searching for different possibilities to help people who suffer from diseases which can be treated with an organ transplant. Besides deceased organ donation, the use of organs from living donors is another possibility. Of course, this is not possible for every type of organ, but it can be a possibility for patients waiting for a kidney, liver or lung.

Some MS have much experience with living donation; others are focusing on other aspects of donation and transplantation. Not every country has had the opportunity yet to expand their current practice on donation and transplantation with this alternative donor pool. Other countries try to investigate other ways to help more people on the waiting list, for example by research on medication, designing technical devices or using organs from other categories of deceased donors, for example donors after circulatory death (DCD) or Expanded Criteria Donors (ECD).

3.2 The concept of living donation

In case of living donation, a healthy person wants to help a patient with terminal organ failure by donating one of his/her own organs, or a part of an organ. Donating one kidney, a lung lobe or a part of the liver during life time is possible. The fact that donating (a part of) an organ is a possibility, does not mean that it is a risk-free procedure. Every surgical operation carries a certain risk, and particularly donation of a part of the liver (3), or a lung lobe (4) is risky.

The current developments within the EU move towards expanding living (kidney) donation, as long as donor protection is ensured and efforts in maximizing deceased donation are maintained. To protect the donor's health and safety, an appropriate framework of donor care should be established. Such an appropriate framework should include proper selection, both physical and psychological, a proper (independent) informed consent procedure, and a possibility to follow a donor's health, including the collection of information on both short- and long-term outcomes. Current experience within MS, that have turned out to be safe and effective, should be used as example for those countries who want to set up or improve their framework.

3.3 Living kidney donation

Kidney transplantation is considered the best therapeutic strategy for many patients with end stage renal disease, providing better results than renal replacement therapy with dialysis, both in terms of survival and quality of life (5- 7). The main problem that precludes the full development of kidney transplantation is the limited availability of kidneys to meet the transplantation needs of the patients. Therefore, transplantation of kidneys from live donors is considered today as a necessary adjunct to satisfying the transplantation needs of a given population. Resolution 57.18 of the 2004 World Health Assembly urges Member States *'to extend the use of living kidney donations when possible, in addition to donations from deceased donors'* (8). In figure 2 the transplantation rate with kidneys from a living donor for each European country is given (9). There are large differences between countries in extensiveness of living donation.

There are different programs for 'types' of living donors. Examples of different programs are (10):

> Specified donation: direct donation to a specific person (genetically and/or emotionally related or unrelated), indirect donation to a specific person (through an exchange / cross-over program)
> Unspecified donation: Donation to an anonymous and unspecified recipient (good Samaritan)

Figure 2: Number of kidney transplants with grafts from living donors p.m.p. within Europe (9)

3.4 Living liver donation

Due to the ongoing and increasing shortage of livers from deceased donors, a number of transplant centres around the world have adopted living donation as a partial solution to this shortage. Within Europe living liver donation is a procedure in which a living person donates a portion of his or her liver to another, mostly a child. Because the liver can regenerate itself, both the transplanted section and the remaining section of the donor's liver are able to regrow into a normal sized liver.

Based on 2013 data, 260 liver transplants were performed within the EU with a liver from a living donor (9).

3.5 Living lung lobe donation

A living lung donation procedure differs from living kidney and liver donation procedures. Living lung donation requires two donors: one person giving one lobe, or portion of their left lung, and the other giving a lobe of their right lung. The two lobes are transplanted into one single recipient.

Donating a lung-lobe during life is very rare. Scientific publications are scarce. Within Europe, it appears that only the United Kingdom has experience with a living lung donation program. If we look across the European borders, living lung donations still seems a rare procedure. Over the period 1993-2006 a total number of 369 living donors in the United States donated a lung-lobe for transplantation (4). From 2002-2004 the number of living lung donors in the United States was stable at 25-29 per year, whilst in 2005 there were two living lung donors (11). A more recent figure shows that from 2010 until 2012 only 2 transplantations with lung-lobes from living donors were performed (12).

4. Living Donor Follow-up

4.1 Living donor follow-up in Europe

Traditionally, transplantation with an organ from a deceased donor results in most countries in follow-up of the recipient and the functioning and survival of the graft. By collecting this data, research is possible for example on many variables that could influence the health and survival of both recipient and graft. In case of living donation, additional follow-up of the donor is necessary. By collecting data on predefined donor items, the circumstances at the time of transplantation and during long term follow-up, research is possible. This research can lead to new insights and developments in the field of (living) donation. Recent studies illustrate the importance of long term follow-up of kidney donors, providing insight in the long term safety and possible health risks of living donation for the donor (13, 14). To be able to collect living donor follow-up data, of course the donor's consent is an absolute requirement.

Follow-up of a recipient after transplantation is assumed to be implemented in (almost) every EU MS. Digital data collection of follow-up data of a living donor after donation, however, is not yet implemented in every EU MS. The previous chapters show that living kidney donation is by far the procedure which occurs most, compared to living liver and living lung lobe donation. Therefore, it is not surprising that most of the MS with a living donor follow-up database have created this for living kidney donors.

4.2 Living donor follow-up outside of Europe

The United Network for Organ Sharing (UNOS) in the United States has experience with the collection of follow-up data of living donors. Since June 2006, UNOS has provided a patient safety system for transplant centres to report medical problems experienced by living donors. Centres must report any living donor death, as well as instances in which a donor's native organ (remaining kidney or other organ of which a portion was donated) fails to function, within 72 hours of becoming aware of this information. Transplant centres must report these incidents for two years after the donation surgery occurs.

Based upon OPTN (Organ Procurement and Transplantation Network) data from 1999 through 2008, of the 3313 individuals who were living liver donors, at least five have been listed for a liver transplant due to complications related to the donation surgery. Of the 60,644 individuals who were living kidney donors from 1999 through 2008, at least seven have been listed for a kidney transplant. However, the medical problems that caused these kidney donors to be listed for transplant may or may not be connected to the donation (15).

5. Current Experience

It is known that there is a wide variation in the experience with living donation (9) and living donor follow-up. The rate of transplantation with a kidney graft from a living donor per million population differs from 0.0 for example in Slovenia to 31 in The Netherlands. In actual numbers, there is a difference of 1 living donor kidney transplant per year in Estonia up to 1,100 transplants with a kidney from a living donor in the United Kingdom. To collect detailed information about the experience with living (kidney and liver) donation and living donor follow-up among the WP4 partners, a questionnaire was prepared.

5.1 Methodology

This questionnaire was agreed upon among associated and collaborating partners and was send to all partners to investigate the MS's current experience with living donation and living donor follow-up. The questionnaire is attached to this report as Annex I.

The questionnaire was divided into 5 focus areas:

1. General information
2. Current experience with living donation and current living donor follow-up
3. Technical specification on the database
4. Detailed specification on the content of the database
   a. Data for evaluation of the donor
   b. Data concerning the donation procedure
   c. Data for follow-up of the donor
5. Practical information about using the database

It was decided, that a predetermined set of items would be named in the questionnaire. Each WP4 partner was asked to complete the questionnaire and to answer whether the items were mandatory and what definitions were used. Besides the items that were currently collected, the respondents were also asked to list the variables that they wished to collect in (a) future (registry).

5.2 Outcome

A brief summary of the completed questionnaires is given in the following paragraph, again divided into the 5 focus areas.

5.2.1 General information and Current experience with living donation and living donor follow-up

A total of 13 partners completed and returned the questionnaire. This included 11 MS and two collaborating partners. Every respondent has experience with living kidney donation. Eight MS and one collaborating partner have, in addition to kidney donation, also experience with living liver donation. One MS has had experience with a living lung donation program in the past.

Seven MS and two collaborating partners already collect their data in a digital registry. Of the four MS without a digital registry, one has indicated to have no interest in such a national registry in their own country. This country prefers a local registry. The other three countries are very much

interested in a national registry. They were asked to complete the questionnaire with a preferred / ideal situation in mind. Some countries just started with the collection of follow-up data of the living donors (Spain, 2010) whereas others have had years of experience collecting data (Norway, 1997). The other countries started mainly between 2000 and 2005.

Table 1: Responding partners and their experience with living donation

Associated and collaborating partners	Experience with living donation	A system to gather living donor follow-up data	Collected in a digital registry
Croatia	Y, kidney and liver	N	N
France	Y, kidney and liver	Y, kidney and liver	Y
Germany	Y, kidney and liver	Y, kidney and liver	Y
Italy	Y, kidney and liver	Y, kidney and liver	Y
Latvia	Y, kidney	Y, kidney	N
Lithuania	Y, kidney	Y, kidney	N
Netherlands	Y, kidney and liver	Y, kidney	Y
Norway	Y, kidney	Y, kidney	Y
Romania	Y, kidney and liver	Y, kidney and liver	N
Spain	Y, kidney and liver	Y, kidney and liver	Y
United Kingdom	Y, kidney, liver and lung	Y, kidney	Y
Scandiatransplant ** ^	Y, kidney	Y, kidney	Y
Hopital Clinic Universitari of Barcelona (EULID project) ^	Y, kidney and liver	Y, kidney and liver	Y

** Scandiatransplant is in charge of the corresponding data collection for Denmark, Finland, Iceland, Norway, and Sweden.
^ Involved in the project as collaborating partner.

5.2.2 Technical specification of the database

Most of the partners, 7 in total, have a registry performing on Oracle applications. Three of the partners that use an Oracle product combine this with another system, for example Access or SQL server. An Excel database will preferably be used by Lithuania and Romania, the last one in combination with FileMakerPro.

5.2.2.1 Responsibilities within data collection

Overall, a member of the transplant team is responsible for the data collection. Transplant doctors, transplant coordinators, nephrologists and living donor coordinators are some of the terms mentioned, but it seems that different names are given to people with the same function or at least working in the same department. Overall, national authorities are responsible for hosting the database, either the Ministry of Health or the national organization that is responsible for organ donation and/or transplantation.

5.2.3 Detailed specification of the content of the database

The inventory has some bias, since some countries did not answer (all) of the questions concerning the specification of the items because they do not apply a digital data collection yet. They have given some answers to the questions with a preferred situation in mind, but some answers were kept blank. This has not influenced the overall impression of the current situation within the associated MS. The definitions that were given by the respondents for each predefined item differ in some cases. It was suggested that internationally accepted definitions should be discussed and agreed upon by ACCORD WP4 in the further development of a registry of registries.

a. Data for evaluation of the donor

The following items were predefined and partners were asked to answer whether the items are collected in their database or registry, whether the items are mandatory and what definitions are used. One country without a registry has not answered the questions.

Table 2: Presence of predefined items for evaluation of the donor in existing national registries

Item	Definition	Mandatory Yes	Mandatory No	Not collected
Age	Age in years at the moment of transplant / Date of birth	12	0	0
Gender	Male / female	12	0	0
Relation type	Relationship between donor and recipient, by some countries specified in every possible type of relation. There is no unanimous definition yet.	11	0	1
Weight	Weight in kg.	5	6	1
Length	Length in cm (EULID uses meters).	5	6	1
Creatinine	Different metrics are applied (Umol/L or Mg/dl)	9	2	1
Blood pressure	mmHg RR Office or automatic Hypertension Y/N Sitting BP before donation	6	5	1
Anti hypertensive drugs	Some countries gave no definition, others answered: > Diet, one drug, two drugs, three or more drugs > Current (at time of donation)	5	3	4

b. Data concerning the donation procedure

Table 3: Presence of predefined items concerning the donation procedure in existing national registries

Item	Definition	Mandatory Yes	Mandatory No	Not collected
Operation technique	Surgical technique used: > Open lumbotomy > Laparoscopy > Hand assisted laparoscopy > Mini lumbotomy > Posterolumbar incision (in conversion of coelioscopy) > Coelioscopy > Under costal	5	4	3
Left or right kidney	Organ donated: left kidney or right kidney	6	3	3
Complications during operation	1. No complications 2. Wound infection 3. Bleeding 4. Pain 5. Thrombosis 6. Pneumothorax 7. Splenectomy 8. Re-operation 9. Other significant complication that can be specified	5	5	2
Blood group	A, B, 0, AB	9	1	2
HLA type	Split, A, B, DR, DP, DQ	8	2	2
EBV	Pos/neg, IgG, IgM	3	4	5
CMV	Serology: Pos/neg, IgG, IgM	4	5	3
Hepatitis B, C	> HBsAg, HBcAb, HBsAb, AntiHCV > HIV, HCV, HBV, Delta virus: pos/neg/not tested Pos/neg	4	4	4

c. Data for follow-up of the donor

Table 4: Presence of predefined items concerning donor follow-up in existing national registries

Item	Definition	Mandatory Yes	Mandatory No	Not collected
Weight	Weight in kg.	3	7	2
Height	Length in cm, only EULID uses meters.	1	7	4
Creatinine	Different metrics are applied (Umol/L or Mg/dl)	8	3	1
Proteinuria	> g/24h > g/L > Dipstick urinalysis and urinary PCR if dipstick is positive	7	3	2
Blood pressure	> mmHg > sitting BP mmHg	8	3	1
Anti hypertensive drugs	Some countries gave no definition, others answered: > Diet, one drug, two drugs, three or more drugs > Any started within the last year at annual review > Yes, No, Unknown	6	4	2
Complication after operation	Answer: 1. Sepsis 2. Lung embolism 3. Deep venous thrombosis 4. Wound infection 5. Bleeding 6. Pain 7. Other, specify Collected 13 items, including 4 socio-economic complications, Within the past year since last review visit, Within 30 days post donation, Death within one month after donation	7	4	1

d. Additional items that are already collected by MS, or items that MS would like to collect

The table in which the additional items are listed, is added to this report in Annex II. Because every project MS could list every item that is collected in a local or national database, this list is relatively long. All items that are mentioned in these schedules, are discussed during the WP4 project group meetings. Especially the remarks of nephrologists were included in these discussions to determine which data are absolutely necessary to fulfil the project goals and which data should be determined as ´nice to have´ or only necessary in a local database but not in an international Registry of Registries. The results of the pilot data set will be described in the next chapter.

5.2.4 Liver data collection

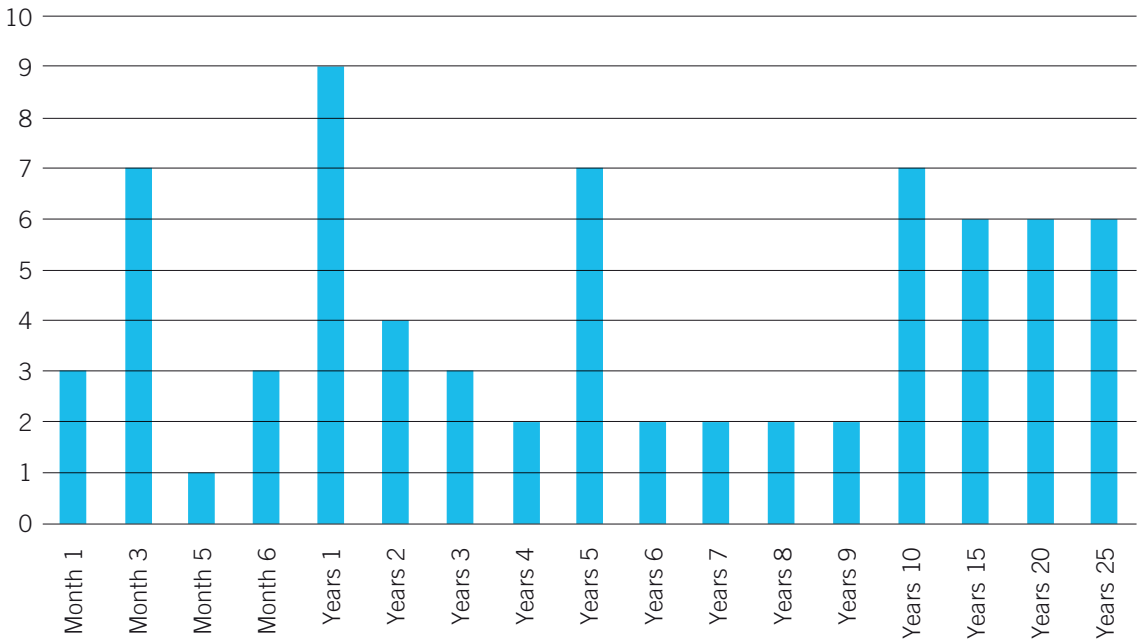
As mentioned earlier, the emphasis of the project is on living kidney donation. Of course, also follow-up information on living liver donors will be collected in a registry. That is why, during the ACCORD WP 4 project, the focus was also on defining a dataset and data dictionary for living liver donors. Hepatologists and liver transplant specialists were consulted to give their insight in necessary data collection.

5.2.5 Practical information about using the database

The number of hospitals or transplant centres in the MS that share their data in a digital registry vary from 1 to 53. The number of donors included in the registries differs from 22 up to 11761 donors. As mentioned earlier, by far the most donors that are included in these registries are living kidney donors. To give an impression: the United Kingdom has a registry containing 11761 donors of which 11519 living kidney donors, 218 living liver donors and 24 living lung(lobe) donors.

The follow-up frequency for each donor between the associated countries is on average 3 times in the first year. The exact moment of follow-up differs. Some patients have to visit their doctor for a follow-up on the first, third and sixth month, others only have a yearly appointment set after the time of transplantation. Figure 3 shows the follow-up moments and the number of countries to which this is applicable.

Figure 3: Living donor follow-up frequency during the first year and after the first year post donation



Two of the MS have a long-term follow-up frequency of one year, four MS have a long-term follow-up frequency of five years. Most of the associated and collaborating partners use a consent form to obtain consent from the donors for using their data in the registry. It is not feasible to give an exact insight in the completeness of the different databases or registries. The involved partners calculate their completeness in different ways, some partners could not specify the way the completeness is calculated and some partners could only give an estimated number, but have no tools to calculate an exact outcome. Therefore, the numbers are incomparable and unclear. Three MS specify a 'baseline' completeness. They mention a completeness rate of 94.7%, 99% and 100%. EULID states that EULID is a research database with a period of data collection from 2007-2009 which calculates no 'level of completeness'. Since this is the outcome of the questionnaire, it only says something about the current situation. It is dissimilar but also unclear for some countries to state the person or committee that determines if a request for data is granted. Some countries have a special 'governing committee' or 'advisory board', others work with protocols. Ten out of thirteen responding partners answered that a specific person is responsible for answering questions and/or analysis of the registry.

5.3 Conclusion of current situation

Overall, it is concluded that living donation is implemented in all collaborating WP4 partners that completed the questionnaire. The emphasis is clearly on living kidney donation. A lot of experience on living donation has been gained so far. The registration of living donor follow-up information is not yet implemented in every MS. There is a great variety between the MS in the number of hospitals that share their data in a digital database or registry, the number of patients that are included and the number of follow up items that are collected. It is concluded that the exchange of knowledge and experience is of great value, especially for those countries with a (relatively) small number of transplants with grafts of living donors.

6. Data Set and Data Dictionary

The results from the questionnaire were used to take further steps in order to accomplish the intention and aims of ACCORD WP4. A very important step towards international data sharing and data comparison is the implementation of a common data set. It is the intention to collect as many items as possible and to achieve a high completeness rate. These goals can contradict each other however. The more items are defined, the greater the challenge to complete all items. To achieve a high completeness rate, it is not possible to define all items as mandatory item, even though all items are valuable. Therefore, a set of mandatory items is defined with items that should be delivered by all MS. Apart from the minimum dataset a more expanded list of items is also defined, listing optional data that could be delivered by MS. Several working group meetings led to the establishment of 4 data sets in total. These data sets include a national kidney data set, an international kidney data set, a national liver data set and an international liver data set.

6.1 National versus international data set

A distinction is made between a data set for a national registry and the data set for an international registry. Reason for this distinction is the fact that some items might be necessary for a national registry, but might not be important for international data sharing. The name of the donor hospital for example, is not interesting to collect in an international follow-up registry. It is important however for a national registry to compare individual donor centres within that country. Looking at the item relation type for another example, there are many different relations a donor and recipient can have towards each other. The greater the variety, the more complex a correct data collection and the greater the chance that data can not be compared because of different interpretations. Therefore, the item relation type is simplified in the international data set. During the project pilot, the data set International Registry Kidney is used for data collection (see Annex III). Adaptations in the data sets as a result of the pilot evaluation have led to a final version (see chapter 15). The following paragraphs explain the differences between the national and international data sets and the differences between kidney and liver data sets.

6.2 National registry kidney and liver

6.2.1 Donor demographic information

This item includes a donor's general information such as a unique identification code, date of birth, age, gender, weight, height, blood group, address, country of residence, nationality and ethnicity. Since these items are very basic and important, and collected in all existing follow-up registries, almost every item is 'mandatory'. Only 'date of birth', address and ethnicity are optional items. These basic donor data are equal for living kidney and liver donor follow-up.

6.2.2 Pre-donation data

For living liver donation, only two pre-donation items are identified in the national data set. These items are 'relation type' between donor and recipient and the item 'any significant co-morbidity'. Both items are labelled mandatory. These items are also identified in the national kidney data set, but five additional items are listed in the national kidney data set. These five additional items are important for living kidney donation, because they give an insight in the

kidney function of a donor before donation. In order to make a comparison of the situation before and after donation, the pre-donation data needs to be collected. The pre-donation items that are collected in the national kidney data set are given in the following table. Note that the item 'any significant co-morbidity is slightly different in the liver data set. The option 'Renal / urinary tract disease' can not be chosen in the liver data set.

Table 5: National data set kidney; pre-donation data

Nr.	Item	Definition	Units	Mandatory / Optional
1	Relation type	A living donor has one of the following three possible relationships with the recipient*: > A/ Related > A1/ Genetically related: a. 1st degree genetic relative: parent, sibling, offspring b. 2nd degree genetic relative: e.g. grandparent, grandchild, aunt, uncle, niece, nephew, c. Other than 1st or 2nd degree genetic related, for example cousin > A2/ Emotionally related: Spouse (if not genetically related); in-laws; adopted, friend > B/ Unrelated: non-related = not genetically or emotionally related.	Choosing one from this menu	M
2	Blood pressure	Actual blood pressure (independent of the method of measurement)	mmHg	O
3	Hypertension		Yes / No	O
4	Antihypertensive treatment	Menu: > Nothing > Diet only > Medication: - Diuretics - Beta blockers - ACE blockers - A2 antagonists - Vasodilators/Calcium channel blockers - Other	Choosing one or multiple items from this menu	M
5	Creatinine		Umol/L or mg/dl	M
6	Proteinuria	PCR (protein creatinine ratio)	mg/mmol creat	M
7	Any significant co-morbidity	Menu: > No > Yes, specify: - Abdominal surgery, specify… - Malignancies, specify... - Hematological disease, specify… - Neurological disease, specify… - Cardiovascular disease, specify… - Respiratory disease, specify… - Gastrointestinal disease, specify… - Psychiatric disease, specify… - Psychological disorder, specify… - Renal / urinary tract disease, specify… - Other, specify… > Unknown	Choosing one or multiple from this menu and free text field for 'specify…'	M

* WHO, Global glossary of terms and definitions on Donation and Transplantation

6.2.3 Peri- and post-operative data (until discharge)

These data give an insight in the details of the donation procedure. For the general information, again there is no difference in the data set for kidney or liver. General information includes 'donor hospital (centre) name', 'country of donor hospital', 'date of donation'. These items are mandatory in the national kidney and liver data sets. Optional items in both data sets are: 'length of hospital stay (LOS)' and 'number of days in ICU during the first admission'.

6.2.3.1 Peri- and post-operative data (until discharge): national kidney

More specific kidney items that are defined in the peri- and post-operative period, are listed in the following table.

Table 6: National data set kidney; peri- and post-operative data (until discharge)

Nr.	Item	Definition	Units	Mandatory / Optional
1	Left or right kidney		Left / Right	M
2	Operation technique	Menu: > Open technique - Classic technique - Costal resection - No costal resection - Mini-incision > Laparoscopic a. Standard b. Hand assisted laparoscopic > Other, specify…	Choosing one from this menu	M
3	Complications during operation	Menu: > No complications > Blood loss: need for transfusion > Kidney damaged during retrieval a. Kidney can be used for transplantation b. Kidney is discarded for transplantation > Other organ damaged during surgery > Switch from laparoscopic procedure to open technique > Cardiac arrest > Other severe complications (i.e. pneumothorax, anaphylactic reaction) (specify…)	Choosing one or multiple from this menu and free text field for 'specify…'	M
4	Complications after operation – until first discharge	Menu: > No complications > Blood loss: need for transfusion > Need for re-operation > Infection (urinary, wound, other) > Thrombo/embolic complications (DVT, pulmonary embolism) > Renal Replacement Therapy, specify… > Cardiac arrest > Other severe complications (specify…)	Choosing one or multiple from this menu and free text field for 'specify…'	M

6.2.3.1 Peri- and post-operative data (until discharge): national liver

The items that are defined for the national liver data set are the following:

Table 7: National data set liver; peri- and post-operative data (until discharge)

Nr.	Item	Definition	Units	Mandatory / Optional
1	Segment donated	> 2 > 3 > 2-3 > 2-3-4 > 5-6-7-8	Choosing one from this menu	M
2	Percentage of remnant donor liver	Menu: > <30% > 30-40% > 41-50% > 51-60% > >60%	Choosing one from this menu	M
3	Complications during operation	Menu: > No complications > Blood loss: need for transfusion > Liver graft damaged during retrieval a. Liver can be used for transplantation b. Liver is discarded for transplantation > Remaining liver damaged during surgery > Other organ damaged during surgery > Cardiac arrest > Other severe complications, specify...	Choosing one or multiple from this menu and free text field for 'specify...'	M
4	Complications after operation – until first discharge	Menu: > No complications > Blood loss: need for transfusion > Need for re-operation > Biliary fistula > Biliary stenosis > Infection (wound, other) > Non-infected collection > Thrombo/embolic complications (DVT, pulmonary embolism, arterial thrombosis, portal thrombosis) > Cardiac arrest > Liver insufficiency > Other severe complications (specify…)	Choosing one or multiple from this menu and free text field for 'specify…'	M

6.2.4 Follow-up data

Even for follow-up there are several items that are important for both types of living donors; kidney and liver. Some information is general information, for example the date of follow-up and the follow-up centre. Other information is general medical information, important in both cases. Examples of this general medical information are the donor's weight, but also whether the donor is lost to follow-up or died (including date and cause of death). All of the abovementioned information is essential for follow-up and therefore mandatory data. Whether the donor returned to his/her previous activity level is important to know for both kidney and liver donors. This information helps to get more insight in the recovery after donation and the consequences for 'general functioning' and overall activity. A person's employment is not considered to be an item that is applicable in all situations. A living donor could be (voluntarily) unemployed before donation, retired or could be a house-wife. Employment would not give information about this persons abilities and disabilities as a result of the donation, and activity level does. This item is an optional item for both national kidney as well as national liver data set.

Health issues that occur during the follow-up period might be related to the donation. Of course this relation is not likely for every health issue. Enabling accurate scientific research, a large amount of high quality data is essential. The item 'health issues' is mandatory in the ACCORD data sets. There is some variation in the national kidney data set and the national liver data set. The variation is emphasized in the following rows:

National kidney
- Abdominal surgery, specify...
- Malignancies, specify...
- Hematological disease, specify...
- Neurological disease, specify...
- Cardiovascular disease, specify...
- Respiratory disease, specify...
- Gastrointestinal disease, specify...
- Psychiatric disease, specify...
- Psychological disorder, specify...
- Renal / urinary tract disease, specify...
- Renal Replacement Therapy, specify...
- Pregnancy, specify (when)...
- Diabetes mellitus, specify...
- Other, specify...

National liver
- Abdominal surgery, specify...
- Malignancies, specify...
- Hematological disease, specify...
- Neurological disease, specify...
- Cardiovascular disease, specify...
- Respiratory disease, specify...
- Gastrointestinal disease, specify...
- Psychiatric disease, specify...
- Psychological disorder, specify...
- Pregnancy, specify (when)...
- Diabetes mellitus, specify...
- Liver disease, specify...
- Other, specify

6.2.4.1 Follow-up data: national kidney

The items in this paragraph are kidney specific in the national data set. These items are related to kidney function.

Table 8: National data set kidney; follow-up data

Nr.	Item	Definition	Units	Mandatory / Optional
1	Blood pressure	Actual blood pressure (independent of the method of measurement)	mmHg	O
2	Hypertension		Yes / No	O
3	Antihypertensive treatment	Menu: > Nothing > Diet only > Medication: - Diuretics - Beta blockers - ACE blockers - A2 antagonists - Vasodilators/Calcium channel blockers - Other	Choosing one or multiple items from this menu	M
4	Creatinine		Umol/L or mg/dl	M
5	Proteinuria	PCR (protein creatinine ratio)	mg/mmol creat	M

6.2.4.2 Follow-up data: national liver

The items in this paragraph are liver specific in the national data set. These items are related to liver function.

Table 9: National data set liver; follow-up data

Nr.	Item	Definition	Units	Mandatory / Optional
1	Maximum bilirubin (within 15 days after surgery)		Umol/L	M
2	Maximum INR (within 15 days after surgery)		%	M
3	AST (at 15 days after surgery)		U/L	M
4	ALT (at 15 days after surgery)		U/L	M
5	GGT (at 15 days after surgery)		U/L	M
6	Platelets (at 15 days after surgery)		10*9/L	M
7	Complications (within the first 12 months)	Menu: > Nothing > Thrombo/embolic complications (DVT, pulmonary embolism, arterial thrombosis, portal thrombosis, lung embolism) > Infection (wound, surgical side infection, infected collection, other) > Non-infected collection > Biliary stricture > Biliary fistula > Liver insufficiency > Hemorrhage > Pleural effusion > Other complications, specify	Choosing one or multiple from this menu and free text field for 'specify:…..	M
8	Readmission (within the first 12 months)	Menu: > Yes, length of hospital stay > No > Unknown	Choosing one and length of admission in days	M

6.3 International registry kidney and liver

6.3.1 Donor demographic information

The donor demographic information that is defined in the national data sets for kidney and liver are the same as for the international registry. The only difference is address. Address is an optional item in the national data set, but this item is not included in the international data set, since it is of no interest for international data comparison.

6.3.2 Pre-donation data

Like in the national liver data set, only two items are listed in the category 'pre-donation data' of the international data set. These items are 'relation type' and 'any significant co-morbidity'. The item 'relation type' is, as mentioned in paragraph 6.1, simplified in the definition of the international data set for both kidney and liver. The relation type is either:

> related: genetically or non-genetically
> unrelated

For kidney donors, additional pre-donation data that are collected in the international registry are the items 'antihypertensive treatment', 'creatinine' and 'proteinuria'.
All of these items are mandatory.

6.3.3 Peri- and post-operative data (until discharge)

The data sets for liver and kidney, both national and international concerning peri- and post-operative data (until discharge) are almost equal. In the national data sets for kidney and liver the donor centre is collected. In the international data sets, this item is not included.

6.3.4 Follow-up data

Blood pressure and hypertension are values that are removed from the international data set for kidney follow-up, as is 'follow-up centre'. In the international liver follow-up data set only 'follow-up centre' is not included anymore. All other follow-up items are equal in the national and international data sets.

7. Registry Requirements

7.1 Concept of data sharing: Registry of Registries (RoR)

Scientific research on living donor follow-up is already of great value to the (international) donation and transplantation society. National databases and registries can provide researchers with national data. There has been international effort to combine existing national registries in the past. A recent example is the EFRETOS project (16) which had the same intention as the ACCORD WP4 project but focused on the collection of follow-up data of transplanted patients. An active international European registry where MS frequently sent in their follow-up data of living donors to expand the amount of collected data is lacking so far. ACCORD WP4 aims to develop the basis for such a registry of registries. Another previous EU co-funded project, the EULID project (17), already started to work towards international data collection of living donors, with data from local centres. The work that was done in this project was very valuable and the experiences were used throughout the entire ACCORD project. Great advantage of the ACCORD project is however, that Competent Authorities are represented instead of local centres.

The current techniques that are used within the MS to collect data vary, as expected. By composing an international RoR, the focus should not only be on the dataset and definitions, but also address the technical requirements to make a RoR work and to make it accessible to every MS. The following chapter focuses on the technical design of a international living donor follow-up RoR. Also the technical aspects of a national living donor registry will be discussed. Co-operation between different countries with different standards, different experience but also different budgets emphasises the need for a clear description of the technical design of a living donor follow-up registry. Miscommunication or failure in the design of different registries could be disastrous for the concept of international data collection and data comparison. Besides an extensive description of the technical requirements, every paragraph also gives the requirements in a clear enumeration.

7.2 Technical requirements: International RoR

7.2.1 General remarks

The new RoR should be designed using the currently available technology. Solutions that will be available in the coming months (or years) are ignored. The standard nowadays for a follow-up database is a relational database, which makes it possible to have an infinite number of follow-up records. Moreover this type of database fits best with the databases that already exist in most countries that completed the questionnaire (Annex I). Another standard for a follow-up database is that it should be web-based. One of the great advantages of a web-based database is that maintenance is only necessary at one place. All other possible solutions will need maintenance at several places, which is not manageable easily for a supranational database. Therefore, the easiest way of building a European RoR is by creating a web-based relational database. This database can be accessed by a special website. The webpage as well as the web-based database should be approachable by the most common internet surfing programmes (Microsoft internet explorer, Apple safari, Google chrome, Firefox, et cetera). The language used for both the web-based database and the website will be English. An option could be that on the basis of login information the screens in the web-based application can change to another language. However, the free text that is entered in the database should always be English. In this web-based database data can be entered either directly by key entry or by file upload from national registries. Both possibilities will be discussed in the following paragraphs.

7.2.2 Direct data entry

The registry will provide the possibility to enter a living donor´s follow-up information directly into the registry by direct key entry. The application will have clear screens with all the items that need to be collected. Some of the items will have drop-down lists to choose from, others will provide the possibility to enter free text. Whether an item is mandatory or optional will be made visible. The application will be easy to use and will have an attractive feature.

The possibility of direct data entry will be especially attractive for those countries with a small number of transplant centres or a small number of living donors. Using the RoR for the collection of national data will be described in paragraph 7.3. Those MS that already have a well-functioning living donor follow-up registry will probably use the file upload module to upload the data from the existing registry into the RoR.

7.2.3 File upload module

If countries already have a living donor registry, data can be uploaded to the RoR, but data items and data definitions should be in accordance with the data items and data definitions of the RoR. There are two ways to achieve this.

1. By changing the items and definitions in the national database for living donors. This adjustment has as a consequence that countries with an already existing registry have to change a lot of their items and definitions before the data can be entered into the RoR. Moreover, the upload file should have the correct format, so it can be well received by the RoR. Upload possibilities are for instance CSV-files (comma separated value), XML files or Excel-files.

From the questionnaire that was sent to every WP4 partner (Annex I), we found that different kinds of databases are used by MS and collaborative partners. For example Access, Oracle, SQL Server and FileMakerPro were mentioned. Of course the MS are free to choose the database platform, as long as data can be uploaded in the predefined format to the RoR.

2. Another possibility to upload data from an existing living donor follow-up registry is by performing a conversion of the collected data into the ACCORD standards. In this conversion, the data from the existing database will be translated in such a way that it meets the definitions that were agreed upon in ACCORD WP4. Without this conversion it wouldn't be possible to compare the data from different MS and living donor follow-up registries.

The RoR must not only have the possibility to upload current data, but also data from earlier donors. For these data, a conversion of the older data should be performed to meet the required ACCORD items and ACCORD definitions. The conversion of data from an existing registry has to be done by the MS themselves. The upload of the older data into the RoR must be a possibility.

7.2.4 Data download possibility

An important feature of the web-based database is that data from the RoR will be available for the Competent Authorities (CA) of a country at all times. Crucial in this respect is of course the question who is responsible for the data and who is allowed to see which data. This important issue will be described in the "Governance" section in Chapter 8. The minimum technical requirement for the availability of the data is a download possibility for the CA of a country (irrespective of whether data is immediately filled in or sent to the RoR by file upload). Only 'own' national

data can be downloaded in this way. Apart from this download facility, standard (fixed) reports should also be available. Depending on the user's rights, the reports will be more or less detailed (see paragraph 8.3.2). These reports will be fixed reports.

Requirements for Registry of Registries:

- ACCORD items and ACCORD definitions
- Relational database
- Web based application
- Approachable by common internet surfing programs
- Official language: English
- Direct data entry possibility
- File upload possibility (from national databases)
- Data download possibility
- Standard report function

7.2.5 Data safety and security

Lacking good data safety and security techniques and policies is fatal for a registry. Making sure that no unauthorised person has access to the data in the RoR, that no one abuses the data or uses it incorrectly and that the data cannot be lost, are examples of data safety and security. The human factor in data safety and security can be managed by defining proper authorisation policies (paragraph 8.3.4). Access is only granted if the user's profile allows this access.

The possibility to change or delete data is only reserved for a limited number of users, also depending on their user's profile. The application will log every modification in the data, including time of the modification and the name of the moderator (the user that was logged-in). The registry should be protected against any spyware or viral software which can lead to the damage or loss of data. Also technical defects or power failure may have no influence on the collected data. Regular back-ups (daily) have to be made to facilitate data safety and security. A separate server, hosted in a different location (possibly in a different country) should be kept, preventing physical damage to be the cause of destroying or losing data. Data that could lead to the identification of an individual should be stored separately from the corresponding data. Only a special key or module can lead to the combination of these data, enabling the identification of the individual. Of course, this key or module is only available for a restricted number of people. For all data in the database (from every country involved) only the co-workers of the RoR have such an access possibility. For each country that has delivered data, only one key is provided to give access to identifiable data of their own country. In case individual centres have entered their data directly in the RoR, these centres should also have one key to have access to the identifiable data of their own centre. Data entry and data transfer (using the upload facility) should take place in a secure environment, using cryptographic protocols such as SSL (Secure Sockets Layer) or TLS (Transport Layer Security). The international standard ISO/IEC 17799 covers data security under the topic of information security. It is recommended that this standard will be followed for setting up the RoR.

7.3 Technical requirements: National database

7.3.1 Countries with an existing living donor registry

Countries with an already existing living donor follow-up database that want to participate in the RoR, will meet some difficulties when joining the RoR. From the questionnaire that was sent to every WP4 partner (Annex I), it was clear that none of the countries with an existing living donor registry had the same items and definitions as defined for the RoR. Either the existing database has to be rebuilt including the ACCORD items and definitions or the upload file to the RoR has to be constructed in such a way that the correct items and definitions are sent to the RoR in the correct format. This last possibility has certainly limitations, and at least some items and definitions will have to be changed in the original national database, because good translations are not always possible. Countries are of course free in the way they proceed, as long as the final outcome is that the file uploads from the national follow-up databases are delivered in the predefined format according to the definitions from the ACCORD project. Countries with an existing follow-up database on follow-up of living donors have two possibilities. Either they can change the data input to direct key entry into the new web-based RoR, or they maintain their national registry under the above-mentioned conditions and upload data from their national registry into the RoR. Good possibilities for file upload are CSV-files (comma separated value), XML-files or Excel-files. Which choice is made by countries with an already existing registry is of course completely free.

7.3.2 Countries without a living donor registry

Countries that currently do not have a national follow-up database, but want to participate in the RoR, can put in data in the RoR by direct key entry. Direct key entry has some advantages. There is no need to build an own national database to meet the EU Directive. Besides the practical advantages, this is also a very cost effective approach. But countries can decide to build an own national database and send data to the RoR by file upload. A good possibility for a new database is a web-based database with exactly the same structure as the RoR, to make communication with the RoR easy (both upload and download). Of course, the ACCORD dataset and definitions should be followed. This database should be a relational database, and have the possibility to upload files to the RoR (for instance CSV-files or Excel-files) according to a format that is readable by the RoR. When there are local databases in the country, the new national database should also have the possibility of receiving bulk data from the databases of the different donor centres. Also local centres should have the possibility to download their own centre data at any time from a national registry. With this feature centres can do statistical analyses on their own data as often as desired.

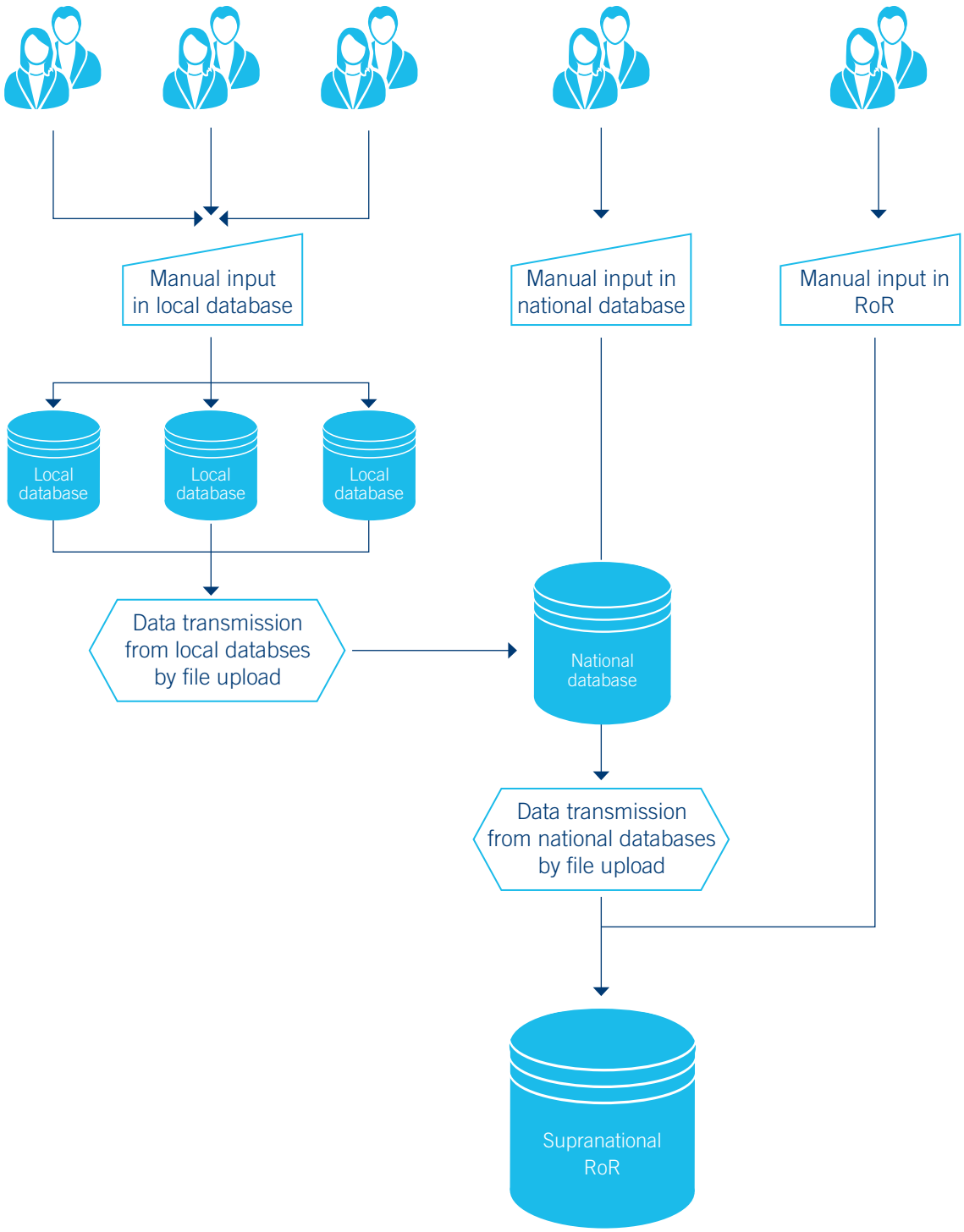
Requirements for National database:

- Conversion to ACCORD items and ACCORD definitions
- Direct data entry or file upload possibility (from local databases)
- Data download possibility

Recommendations for National database:

- Relational database
- Web based application
- Approachable by common Internet surfing programs
- Direct data entry and file upload possibility (from local databases)

Figure 4. Graphic of the structure of the different databases



8. Governance and Organisation

A complete set of follow-up data of living donors from every MS is of enormous value. Without these data we are unable to make a thorough analysis and draw conclusions about for example the differences in donor-characteristics, in national strategy or in surgical procedures. To ensure the completeness of the data, the integrity of the data and also the availability of the data it is absolutely necessary to create an effective and reliable governance strategy. This governance strategy applies to numerous elements that are involved in the (inter) national database.

8.1 Governance strategy

Governance means that one is working towards a situation that is 'under control'. In the case of a living donor follow-up registry and especially in the case of an international living donor follow-up RoR, the situation is rather complex. Different donor centres will be entering their donor's follow-up information into a national system and different EU MS will be collaborating in the RoR. Therefore, a solid governance strategy should be worked out.

First of all, the database architecture should be in order. This means that the technical requirements are met and that the system is reliable. The previous chapter has described the design of the database and the technical requirements concerning, for example, state of the art functionalities and applications, security control and safe back-up systems.

Secondly, the organisation of the registry and the way the processes are managed should be in place to govern a database. This means that the people that are involved with the daily support, maintenance and control need to be united in an organisational structure. Process management will focus on improving and developing the possibilities of the application to collect the information in the database. Taking care of authorising people (according to the authorisation rules that are described in policies, paragraph 8.3.5) is a task that needs to be fulfilled on a daily (or weekly) basis.

Very important is that requests for research, data downloads or national reports should be managed as well. This will be done by a steering committee. Governance of the RoR from the point of view of the MS involved should be applied by an Assembly. The tasks and the composition of the Assembly and steering committee will be defined in paragraph 8.2.3 and 8.2.4.

In third instance, rules, regulation and policies should be developed. The legal prescriptions in the MS concerning data collection should be met, but also specific questions should be answered. What is the aim of the data collection? Who owns the data? Who will use the data? The answers to these questions should lead to a clear set of rules that can be applied in the management of the processes.

Eventually the database needs to be filled with data. These data will be entered into the database by doctors, nurses or data collection employees in the donor hospitals. The human factor is the fourth and last element. Without this element, the previous three are useless. On the other hand, the human factor would not be able to collect living donor follow-up data in an organised manner

without a system, policies and management. The people completing the data should realize that their input contributes to an increase of the quantity but also influences the quality of the data (entering the correct data in the correct way).

The technical design and architecture of the registries is extensively discussed in the previous chapter. The next paragraphs will focus on the elements 'organisation', 'policies' and 'human factor'.

8.2 Organisation

8.2.1 Introduction

Different people are involved in the RoR. First of all, the people from the donor centres who fill in the data, either in their own local database or in their national database or directly by key entry in the RoR. Secondly, the people that are involved in the national database, who are responsible for the data entry in the national database, but also for the upload of the national data into the RoR. They also will be responsible for the authorisation of people for the RoR in their own country. Thirdly, people working directly with the RoR, who are responsible for the daily routine (further referred to as 'RoR staff members'). Fourthly, there should be a body that is responsible for the overall management of the RoR, including also the responsibilities for major decisions concerning the RoR. All participating MS should be represented in this body (further referred to as 'Assembly'). To make things more practical, a fifth group should be defined, which is a small group with the direct daily supervision of the RoR (further referred to as 'steering committee'). Tasks and responsibilities of each group are given in table 7.

Table 10: Tasks and responsibilities in the organisation

Responsibility	Responsible party
Data entry, review and correction	MS (local professionals that enter the data, co-workers of the national database)
Data integrity	MS (local professionals that enter the data, co-workers of the national database)
Data completeness	MS (local professionals that enter the data, co-workers of the national database)
Conversion of data from an existing living donor registry to ACCORD dataset and dictionary	MS (local professionals that enter the data, co-workers of the national database)
Authorisation for access to the RoR for national co-workers	MS (co-workers of the national database)
Daily support, helpdesk, database management, (technical) development and improvements, releases, etc	RoR staff members
Authorisation of MS	RoR staff members
Data safety and security	Steering committee.
Management of RoR staff members	Steering committee. Depending on the further structure this can be delegated to a Host company
Major changes in the RoR (proposals for extra or other items, proposals for other definitions etc)	Proposed by Steering committee, approved by Assembly
Evaluation of requests for data	Steering committee
Communication concerning requests for data	Steering committee (delegated to secretarial staff RoR)
Finance and budget control	Steering committee
Appointment of the steering committee	Assembly
Monitor and control of steering committee	Assembly
Appointment of Assembly	MS

8.2.2 RoR staff members

A web-based database is a solution with a minimum work load for people who manage the database, but still a lot of work has to be done. It can be expected that many different people will fill out data in the RoR and many people are involved in the upload and download of data. All these people need access to the data on different levels. The management of user names and passwords will need continuous attention. This can best be organised on a national level by the appointment of an administrative application owner. The national 'administrative application owner' will communicate with an overall functional application manager. This functional application manager is also responsible for data entry and data management at the RoR. This co-worker is also responsible for authorisation of MS as a country.

The functional application manager is part of the RoR staff and also plays a role in optimising the registry and in the development of the registry to improve the possibilities, functionalities and features. Suggestions for improvements can come from (daily) contact with users, but also from formal national representatives or CA's. The steering committee is the body that decides whether such a change in the system is allowed. Once a year, the Assembly will check all activities of the

steering committee. The functional application manager will consult an (external) ICT developer for the technical adjustments and improvements. Besides taking care of the database, also a website has to be built and maintained. An important part of the website will be the reports, which will be renewed every year. These items will be described in paragraph 8.3.2. For the entire task of daily support and (functional) application management it is expected that three employees are necessary. One employee is responsible for data management and functional application management, one for biostatistical analysis and one for secretary work. These three functions are not full time equivalents. An ICT developer can be hired (subcontracting).

8.2.3 Assembly

Due to the complexity of the registry and the fact that many MS are involved, it is necessary to have tasks and responsibilities appointed to an (international) committee and / or Assembly. In the Assembly all countries that participate in the RoR should be represented. The main tasks of the Assembly are: the appointment of the members of the steering committee and the governance of the steering committee. Important decisions concerning the structure of the RoR, the items in the RoR with their definitions will be the responsibility of the steering committee, but the Assembly will check all these activities and judge whether the policies of the RoR are carried out correctly. All MS that participate in the RoR will depute one representative. This representative is either involved in living kidney donation, or in living liver donation. The representative will be appointed by the CA of their country and should be a specialist in the field of living donor registries and collection of living donor follow-up data. All of the representatives together, form the 'European Living Donor Registry Assembly' (ELDRA). Given the fact that 28 countries are currently members of the EU, the ELDRA could theoretically consist of 28 persons (in the case that all MS participate in the RoR). The Chairman of the ELDRA needs to have a broad understanding of clinical, technical and regulatory issues. The independent Chairman is appointed by the Competent Authority Meeting. This way, the ELDRA is firmly linked to the CA. The role of Chairman of the ELDRA will be fulfilled for three years. The Chairman can be re-elected once. Therefore, the same person can be Chairman of the ELDRA for a period of six years. The ELDRA will meet once a year. It could be a possibility to link the meeting of the ELDRA to an annual congress, for instance the ERA-EDTA (European Renal Association – European Dialysis and Transplantation Association), or to a CA meeting. The ELDRA is quite large and only meets yearly which makes it difficult to take easy and fast decisions. A smaller group from the ELDRA will be appointed to form the steering committee. The ELDRA will monitor and control the steering committee on a yearly basis. The Chairman of the ELDRA cannot be a member of the steering committee.

8.2.4 Steering committee

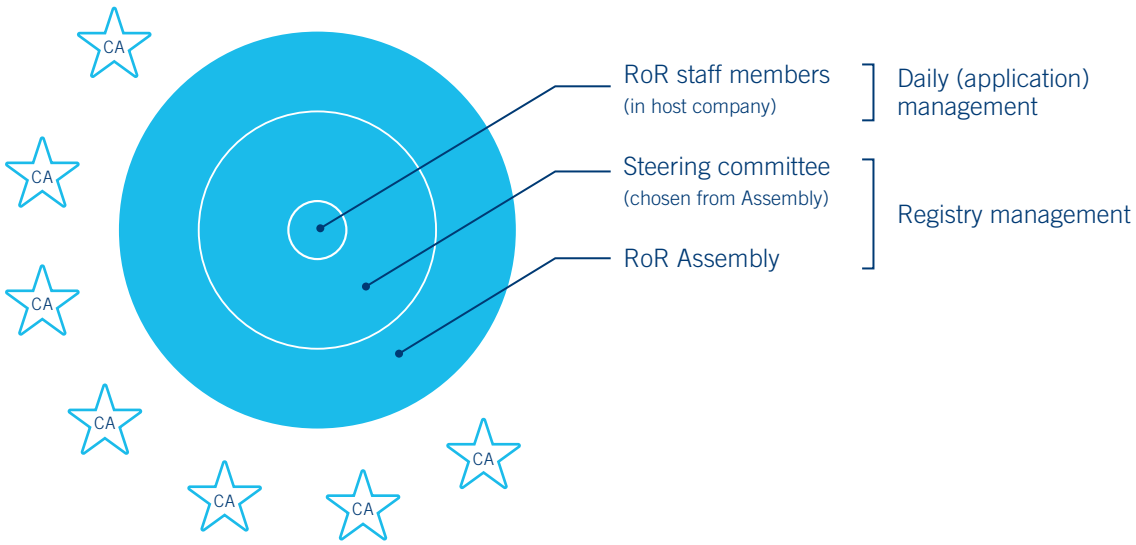
The steering committee is responsible for reviewing (and granting) requests for data or non-standardised reports. A request for data should be answered within a few days. The final decision as to whether a request will be granted will be sent within two weeks. The steering committee should therefore discuss requests with each other by e-mail or telephone. The steering committee keeps close contact with the RoR staff members. The committee receives administrative and secretarial support from the RoR staff. In case of (large) financial investments, the RoR staff have to ask the steering committee for approval. The steering committee will meet in person preferably three times a year. The steering committee keeps a record of the requests that were discussed and the grants that were given and reports to the ELDRA.

The steering committee consists of 5 people. These people will be chosen from the ELDRA. Members of the ELDRA can nominate themselves to take part in the steering committee. By taking a vote, the other members of the ELDRA will determine who will participate in the steering committee. The steering committee includes 4 members involved in living kidney donations and 1 in living liver donation. Since a technical (database) expert and a (bio)statistical expert are foreseen in the staffing plan, they can be consulted if and when necessary. The composition of the Steering Committee will rotate every three years on a rolling basis (so that all committee members are not retiring at the same time). Each member represents another country. The ELDRA should ensure that at least one of the top 3 countries is represented in the steering committee. The definition of this 'top 3' is: 'countries that have included the highest number of donors yearly in the RoR'. The benchmark should be performed the year before the election.

8.2.5 Host company

The RoR is a small organisation, which is too small to be a self-supporting organisation. Therefore the RoR is preferably hosted in an already existing organisation, which is familiar with transplantation and/or donation and has several possibilities for data management. The host company should also have all functionalities and applications for security control and back-up systems. In this structure the (overhead) costs can be kept as low as possible. Personnel should be employed in the host organisation (shared services personnel), which makes daily (hierarchical) control and continuous support possible. The steering committee remains responsible for the RoR staff members, but can delegate the practical responsibility for working conditions, wages, et cetera to the host company. The staff of the RoR are accountable to the steering committee and will be required to attend their meetings. The employment of the RoR staff will not be a full time job.

Figure 5. Structure of the organisation



8.3 Policies

A supranational RoR will serve different MS, each with its own national rules and regulations. Besides rules and regulations, the different stakeholders each have their own interests and goals. The EU Directive 2010/53/EU (1) which applies to every EU MS states that MS need to have a 'register or record' of living donors and a system for the collection of follow-up information from the donor in order to 'identify, report and manage any event relating to the quality and safety of the donated organ'. It does not describe the exact design or the obligation that this should be a digital system.

8.3.1 Completeness

Countries are responsible for the collection of the follow-up data of their living donors, either in a national registry or in an international RoR. Data integrity as well as data completeness influence the reliability of the database and therefor the usefulness. Any scientific results from data analysis rely on the accuracy of the data that is entered into the registry. Data completeness is an important value to indicate the number of living donors included, as compared to the total number of people that donated an organ (or part of an organ) by life. The number of follow-up records that are included in the database as compared to the number of records that should be included is another way of calculating the completeness. A clear policy should be developed to define 'completeness'.

8.3.2 Standard (fixed) reports and graphs

As mentioned in paragraph 7.2.4, the RoR application will have a data download possibility. This feature enables CA to download their 'own' national data either as an extract from the database (Excel) or in a predefined format (graphs and / or tables). These reports will be fixed reports, which means the format of the report is standardised and the data will be refreshed once a year. The extent of details in the reports depends on the authorisations. For example, a general report or graph concerning the completeness of the whole registry, a general overview of the average age of a living kidney or liver donor, the distribution of male and female among donors are standard items that will be public information on the website in fixed reports. When the information concerns a specific country or even centre, of course this information is only available for those people that have the rights to receive this, considering their authorisation. A representative of the CA of a MS will be authorised to see information from the whole MS. The steering committee takes care of possible adjustments in the standard reports and graphs. Once a year, the ELDRA will check all activities of the Steering Committee, including changes in fixed reports and graphs. The next paragraph will focus on the ownership of the data and paragraph 8.3.5 handles the authorisation policies.

8.3.3 Ownership and data requests

One of the items to handle is 'ownership of the data'. This item needs clear policies about who is allowed to see or retrieve the data from the database. There are several ways of considering the ownership of the data. Whose data are they? What is the aim of the data collection? Who will use the data and with what purpose? Who is allowed to use the data and are there any restrictions (by law)? The answers to these questions lead to appropriate policies. The donor centres are the primary owners of the data. Therefore, requests for an extract of their 'own' data by a donor centre should be granted without restriction. The CA in those MS with an existing national follow-up database can be granted permission to receive an extract of their 'own' national data without

restriction as well. It is a greater challenge to set rules for requests for data from other centres, MS or organisations. A protocol should be developed how the requests of data should be processed, including policies on scientific publications et cetera. It is recommended to distinguish three categories of requests:

The donor centres are the primary owners of the data. Therefore, requests for an extract of their 'own' data from a national registry by a donor centre should be granted without restriction. It is a greater challenge to set rules for requests for data from the RoR from individual centres, MS or organisations. It is recommended to distinguish three categories of requests in the RoR:

1. The first type of request is for data that are simple and should be made available for the greater public. These data are always general data, for example the number of donors in 2013 in Europe, how many of these are women, et cetera. The first task of the steering committee is to define which data will be categorised under this type of request. The ELDRA has to approve eventual proposals of the steering committee. If this is defined, these kinds of requests can be granted in all occasions without consulting the steering committee. Most of these data will also be available via standard (fixed) reports on the website of the RoR.
2. The second type of request is for data (mostly by one of the participating countries), not only from their own country, but also for data from more (or all) countries. It is essential that with this type of requests individual countries (or patients) cannot be identified and the data are anonymized. All requests of this type should be considered by the steering committee.
3. The third type of request is for data which can lead to the identification of countries and/or individual donors. In principle it should not even be possible at all to identify an individual donor, since the data in the registry is collected anonymously, but the countries' names are collected and the steering committee must identify such a request. In case of a request of this type, all countries that can be recognised should be asked for permission to deliver these data. In the extreme rare case of one or more identifiable donors the donor country should also be asked for permission. Whether or not the individual donor has to be asked for permission to use their data is the responsibility of the donor country according to the national legislation.

It will be necessary to develop more detailed and explicit criteria and principles against which request for data can be assessed. Describing these detailed criteria and principles is a role for the steering committee. The abovementioned categorization is also applicable for setting up a national registry. In case of a national registry, the sensitivity on centre and individual donor recognition is even greater and should be taken into account very carefully.

8.3.4 Anonymity

The anonymity of a donor's information should be assured. There should be no fear for a donor that personal information will be made public at any time, identifying him or her. Therefore, a donor's name will never be provided in requested files. Nevertheless, especially at a local level, a combination of items could lead to the identification of an individual. Of course for scientific research on a large scale, it is of no significance to the researcher to know a donor's identity. If there is any possibility that a donor could be identified, the local donor centre has the responsibility to ensure that no one objects to using the data. Not only should the anonymity of a donor be considered. Also a local centre should not be recognised on a supranational level. Of course, at a national level, each CA probably wants to know the similarities and differences between multiple donor or transplant centres. On a supranational level however, this should not be visible. It is of no importance for other MS to know the differences between local centres.

8.3.5 Authorisation policies

Different people living in different countries and working in different institutes in different types of functions will be working with the (supra)national RoR. Some people will be entering data, while others will be extracting data from the registry. Different user-profiles will be identified. Depending on the function and tasks, a certain profile will be assigned to a person. The profile determines which authority is granted, for example the right to enter data, the right to change data, the right to extract data on a centre level, the right to extract data on a national level, the right to view general information or the right to see detailed information. On a national level, the national application owners will be responsible for applying the authorisation policies. A person can send a request for access to the (supra)national Registry (of Registries) using a special link on the website. Information concerning the function and associated tasks will determine the profile and corresponding rights.

The application will have the possibility to set the language for direct data entry. This setting will be profile-driven. The national application owner can set the language for users in his / her own country. Of course, users are free to change the standard-language at any time. Free text data entry, however, must be in English. The standard language of reports will also be English. In the next table the different rights are given. One person can have one or more of these rights.

Table 11. Rights of co-workers

Rights for the RoR	Co-worker*	Granted by
To grant rights to individual national co-workers of donation centres	National application manager	Functional application manager at the RoR
To view national specific reports	National application manager	Functional application manager at the RoR
To view national data	National application manager	Functional application manager at the RoR
To enter national data in the RoR by key entry	National application manager	Functional application manager at the RoR
To change national data in the RoR	National application manager	Functional application manager at the RoR
To upload national data from the national registry	National application manager	Functional application manager at the RoR
To extract national data from the RoR	National application manager	Functional application manager at the RoR
To view all reports	Functional application manager at the RoR	Steering committee
To construct all reports	Functional application manager at the RoR	Steering committee
To change all reports	Functional application manager at the RoR	Steering committee
To view all data –(anonymised)	Functional application manager at the RoR	Steering committee
To change all data	Functional application manager at the RoR	Steering committee
To make extracts of all data	Functional application manager at the RoR	Steering committee

* The co-workers listed in this column are examples.

8.4 Human factor

As stated earlier, the human factor is essential in the collection of living donor follow-up information. The donor will visit the doctor for a periodic consultation. The (medical) follow-up information after having donated his/her organ needs to be entered into the database. The doctor or assistant who collects the follow-up information has a responsibility in collecting the items that were predefined in the ACCORD working group. The way these items are interpreted and the definition that is used should also correspond with the definitions that were agreed upon within the ACCORD WP4 group. The person that enters the data into the database has the same responsibility and is also responsible for the correctness of the data. Therefore, data accuracy and data integrity are aspects that rely on the precision of the person who collects the data and the person that enters the data into the registry.

Rules should be developed in which the consequences of incompleteness and incorrectness are described. If it turns out that the items and definitions that are used in a local and/or national database are different from the ACCORD dataset and definitions, then a conversion of the data should take place. Otherwise, the data cannot be compared to the data from other centres / MS. This is described in the technical requirements, chapter 7.

8.4.1 Integrity of the data

To maintain the integrity of the database a system of regular audits should be organised by the CA of EU MS. Sample data taken at random should then be checked by an audit committee. The CA of the EU MS will be advised to install a national audit committee and to develop an audit system to ensure the validity and accuracy of the data collected in the registry. The national audit committee sends an annual report to the ELDRA.

8.5 Future perspectives of data collection

One of the great challenges of maintaining a RoR is to obtain follow-up information. Living donors are in principle healthy persons (that is why they have been selected for the donation operation), and most of the time reluctant to see doctors after the donation procedure. Financial issues may play a role as well, for instance if the insurance companies ask for an own financial contribution for a doctor's visit. A solution would be to organize the RoR in such a way that individual donors can enter their own data in the database. Follow-up would then be much easier, although even then follow-up of laboratory values will be difficult. A combination of entering data by the donor himself/herself and regular doctor visits would be ideal, where the intervals for the doctor visits can be large.

9. Financial Aspects

9.1 Estimated budget for setting up and sustaining a RoR

Based on the proposal in the EFRETOS project (14), an estimated budget can be made on the required resources and manpower necessary for setting up and sustaining a RoR. For this calculation several assumptions are made.

9.1.1 Functional and structural assumptions used for the cost calculation

A major point for making these assumptions is to keep costs of the RoR as low as possible.

The RoR will:

- be hosted by a contracted well-established organisation, experienced in running a registry in the field of transplantation;
- sustain running costs that are appropriate in relation to the number of participating national registries;
- have outsourced personnel from the host organisation for setting up and maintaining the RoR, in order to keep the costs as low as possible. Have clear reporting relationships and accountability for the RoR function.

The RoR will include:

- web service enabling importing of data from other registries;
- web-based application for direct data entry, data cleaning, data storage, and data removal;
- storage in a central relational database management system (Oracle or other) with high security level (authorisation);
- back-up facilities and facilities to ensure that identifiable data are not stored together with the follow-up data.
- export functionality to registries;
- business intelligence software;
- online analysis tools;
- website for general information and dissemination.
- annual reports and accounts

9.1.2 Cost estimate for the RoR

Different phases can be distinguished in the evolution of the RoR. These phases will have an impact on the costs. During the first year (start-up period) extra personnel has to be hired, policies have to be developed, processes have to be organised, hardware investments have to be made and quality checks will be performed to evaluate and optimise the policies and processes. Most importantly the core applications have to be built and tested. This results in higher costs in the first year. After the first year, the yearly costs are stable. The cost estimate in the following table is expressed in euro (€) 1000.

Table 12. Cost estimation for the RoR

Cost estimate	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Personnel						
IT support for hardware and software*	50	20	20	20	20	20
Data entry/data management*	40	40	40	40	40	40
Biostatistician*	10	10	10	10	10	10
Secretary*	50	40	40	40	40	40
Book keeping/accountancy*	10	10	10	10	10	10
Housing / accommodation	10	10	10	10	10	10
Total personnel costs	**170**	**130**	**130**	**130**	**130**	**130**
IT infrastructure costs						
Initial development of the IT system/maintenance*	100	10	10	10	10	10
Software licenses*	20	10	10	10	10	10
Other costs						
Expenses for Assembly	10	10	10	10	10	10
Expenses for steering committee	10	10	10	10	10	10
Sundries	30	20	20	20	20	20
Total annual costs	**340**	**190**	**190**	**190**	**190**	**190**

* Shared services personnel.

9.2 Possibilities for financing

Financing a project as described above is a real challenge. To start up a RoR but also to ensure a sustainable RoR, money is essential. Different possibilities for financing are:

1. EU grant, this would be particularly useful in the first three years of the RoR. After three years the financial position could be evaluated with continuation of the EU grant or choosing one or more of the below mentioned items,
2. The country that hosts the RoR will also pay everything that is necessary to sustain the database. A rotation scheme could be made for hosting the database.
3. Finance based on contribution from MS:
   a. based on the number of donors included,
   b. based on the number of inhabitants per country,
   c. based on the type of data entry (direct data entry or file upload),
   d. based on the gross national product
   e. each country that participates in the RoR pays the same amount of money.
4. A combination of two or more of the abovementioned items.

9.2.1 Questionnaire about future financing and hosting of the RoR

In January 2015 a questionnaire was distributed among the participating countries of WP4 to analyze which funding is preferred, and whether a country has possibilities to host the RoR. In Table 13 the questions are depicted.

Table 13. Questionnaire about financing and hosting of the RoR

Position towards participation in future registry (of registries)
A. Not interested in future participation
B. Interested in using the registry as a national registry
C. Interested in participating in the registry for sharing data internationally
Position towards using WP4 data set and recommended standards
A. Not interested in adapting anything in existing situation
B. Willing to adjust existing data set to ACCORD data set
C. Willing to build new registry according to ACCORD standards data set
Financial plan of preference
1. All countries contribute equally
2. All countries contribute an amount, based on the size of their population
3. All countries contribute, based on the number of living donors per year
4. All countries contribute, based on the GNP (gross national product)
5. One partner facilitates RoR and takes responsibility for financing
6. The RoR is paid for by the European Union (limited period)
7. A combination of abovementioned possibilities
Position towards hosting and managing a future RoR
No: not interested
Yes: Interested

The questionnaire was sent to 15 countries that participated in WP4, and to 4 associated partners. Feedback was received from 13 participating countries and from 3 associated partners. From the participating countries 10 were interested to join a future RoR and these countries were all willing to adapt their already existing data set to the new ACCORD definitions. Financing showed a more divers picture. Six countries were in favour of financing by the EU (at least for the initial phase). For future financing, these six chose a combination with other financing possibilities as did 1 country for structural financing from the beginning. 3 countries did not complete this item, mainly because they were not interested in participating in the future RoR, 1 country was in favour of a financing system based on the number of included donors and 1 country prefers the option of all countries contributing equally. Two of the associated partners want to host the future RoR.

9.3 Summary

The great majority of respondents wanted to participate in a future RoR, were willing to adapt their existing database, and were in favour of a financing system in the starting years by an EU fund. Two organisations indicated that they wanted to host a future RoR. Decisions about a future RoR, a financing system, and hosting the RoR have to be taken by the CA's of the participating countries in the RoR and the EU.

9.4 Other possibilities for follow-up of living donors in Europe

Apart from the construction of the RoR as worked out in the previous paragraphs, some other considerations have to be mentioned. In the first place in the questionnaire mentioned in 9.2.1 one country wanted to participate in the RoR only with aggregated data (not with data of indi-

vidual donors). This was not foreseen in the present database structure, but this is a suggestion worthwhile to investigate. A second consideration was that it should be possible in the future RoR for donors to complete data by themselves. The problem with donor follow-up is that donors are healthy people and reluctant to go to hospitals or doctors. If they have the possibility to enter their own data in the follow-up registry, the completeness could be much improved. However, this was not foreseen in the current structure of the RoR, but this is also a suggestion worthwhile to investigate. A third consideration is a construction, in which participating countries all have their own living donor registry, and once every so many years, data are collected for analysis. From our pilot it is clear that such a solution is only possible if the participating countries all use exactly the same data items, and data definitions. Such a possibility must be seen as a sort of escape solution in case hosting the RoR by one country or organization proved to be impossible. The financial implications of this last mentioned solution is not further investigated, but it is assumed that this solution is more expensive, might need more technical support and is not flexible enough to facilitate more spontaneous analysis. This solutions means that no country can use a RoR as a national registry, thus every country needs to install a national living donor registry themselves.

10. Pilot Registry

Part of the ACCORD project is to test the recommendations that have been described in the project's milestones by performing a pilot phase. The two previous milestones that were tested in the pilot were the dataset and data dictionary Registry of registries KIDNEY (Annex III) as well as the technical specifications (Chapter 7). The pilot can be seen as a proof of concept.

10.1 Pilot approach

10.1.1 Preparations for starting the pilot phase

The pilot phase is an essential part of the project. The feasibility of the recommendations will be concluded from this pilot. In month 16 and 17 of the project, the first preparations for performing a pilot were started. There were some ambiguities about the way the pilot should be performed and to what extent this pilot should be performed. After these were discussed the scope and expected end point of the pilot were clear. A set of 'general' pilot specifications were described. These specifications were:

- Complete ACCORD data set and data definitions – KIDNEY only
- Relational database
- Web-based application
- Approachable by common Internet surfing programs
- Official language: English
- Direct data entry possibility
- File upload possibility (from national databases)
- Data download possibility

Two collaborating partners with prior experience in setting up a (n international) registry were asked to write their proposals about performing this pilot. Eurotransplant's experience derived from the EU funded project EFRETOS. Hospital Clinic of Barcelona has experience with setting up a registry as a result of the EU funded project EULID. During the interim meeting in Madrid in October 2013, both Eurotransplant as well as Hospital Clinic of Barcelona presented their plans and the possibilities for performing the pilot within the given budget. Time and money were limiting factors in setting up the pilot registry. Hospital Clinic of Barcelona had already a registry structure in place that would fit for the ACCORD pilot as well, within the given budget. As a result of the possibilities presented, it was decided to perform the pilot in close co-operation with the Hospital Clinic of Barcelona.

10.1.2 Subcontract Hospital Clinic of Barcelona

The conditions and agreements between the Dutch Transplant Foundation and the Hospital Clinic of Barcelona for performing the ACCORD WP4 pilot were confirmed in a subcontract, signed by parties on 30 April 2014. The responsibilities, obligations and reimbursements were described in this subcontract. Hospital Clinic of Barcelona would facilitate the ACCORD data collection based on the specifications that were established by the working group. Data protection, but also technical support was supplied by Hospital Clinic of Barcelona. The ACCORD consortium, more specifically, the countries that participated in the pilot, are the owner of the data. The Dutch Transplant Foundation was responsible for performing the analysis. No results of the analysis may be published without the ACCORD WP4 working group's prior consent.

10.1.3 Pilot cohort and countries included

It was decided to include the one-year follow up data of all living kidney donors that donated a kidney in 2010 and 2011. Ten partners showed interest in participating. Active participation involved the collection of follow-up data in the ACCORD WP4 pilot registry. One partner eventually withdrew his first interest because of capacity problems, not due to lack of interest. Eventually five countries entered their living donor's follow up data in the ACCORD WP4 pilot registry using the direct data entry possibility. Four other countries tested the data entry of larger number of records from their existing living donor follow-up registry into the ACCORD WP4 pilot registry, using the file upload possibility.

10.2 Pilot performance

The ACCORD WP4 Pilot Registry started the data collection by facilitating the direct data entry possibility in the last week of April 2014. All the participating countries had received their login details to enter the secured website to approach the registry. The second phase of the data collection involved the file upload possibility. The file upload module became available in the first week of July 2014. All partners finished their data inclusion in the second week of October 2014.

11. Pilot Evaluation

11.1 Scope of the evaluation

As mentioned before, the pilot cohort included all donors that donated a kidney in 2010 or 2011. Their baseline characteristics, peri-operative data and one year follow-up data were collected. The main outcome of the pilot is that the recommendations as described in Chapters 6 and 7 can be applied to a RoR. A second goal of the pilot is to evaluate the follow-up data of the donors included. Many different aspects were tested and from the evaluation of these tests, adaptations can be made and recommendations are based on piloted experience. The focus of the evaluation was on three main elements:

1. Practical evaluation
2. Technical evaluation
3. Data evaluation

The parameters that were used to perform the evaluation are listed in Annex IV. This chapter describes the outcome of the analysis and presents the piloted recommendations per element.

11.2 Project evaluation

11.2.1 Cooperation with Hospital Clinic of Barcelona

Cooperation with Hospital Clinic of Barcelona went very smooth. Especially in the phase of establishing the ACCORD WP4 pilot registry, frequent contact between the project leader and Hospital Clinic of Barcelona was necessary. After the pilot phase had started, Hospital Clinic of Barcelona was available for answering questions from the project leader as well as from participating countries. Weekly reports were sent to the project leaders to give updates on the number of login moments per country and the number of donors that were included in the registry. These reports were used to monitor the progress of the data collection and to see if any adaptations in the project planning should be anticipated. Before starting the data analysis, the downloaded data had to be checked for any extraordinary values or possibly incorrect records. During this phase, which was performed in October 2014, Hospital Clinic of Barcelona was available for support and made modifications in the database (business rules) if necessary. Their response has always been very prompt and accurate. The contract between the WP4 leader and Hospital Clinic of Barcelona terminated on 31 December 2014. All users that were involved in ACCORD WP4 will be deactivated on this date. The collected data will be destroyed after the project is finished unless specific permission is given to maintain the database by the ACCORD WP4 partners that actively participated in the pilot.

11.2.2 Cooperation with participating partners

Eighteen professionals, representing 9 countries were involved in the data collection. Communication as well as collaboration between the partners, Hospital Clinic of Barcelona and WP4 leader went well. Some countries were enthusiastic with their participation and shared their progress in the data collection. Other countries needed an extra reminder, but everyone has responded to requests eventually. Frequent reminders and friendly recalls were sent if deadlines were close to expiring or even far behind schedule. The project process went according to expectations, keeping in mind the calculated delays and uncalculated struggles that regularly appear in a project with a size like this.

11.3 Pilot evaluation

To achieve a genuine insight in the practical experience of the people that used the ACCORD WP4 pilot registry, an online questionnaire was sent to all actively involved participants. These 18 professionals received an e-mail with the link to the tool. The questionnaire could be completed at once, or could be interrupted and restarted at another moment, saving the results that were completed in an earlier stage. The questionnaire included questions about different practical aspects of the registry which questions and results will be evaluated in the paragraphs following.

Data collection by completing the questionnaire was available during a period of two and a half weeks (12 effective working days). Two reminders were sent during these two and a half weeks to stimulate the participants to complete the questionnaire. In practice the questionnaire remained 'open' until November 20th 2014.

A total number of 9 respondents completed the questionnaire. Since it is an anonymous questionnaire, it is not possible to check whether these respondents represent all participating countries, but an analysis of the answers leads to the assumption that (almost) every country has completed the questionnaire. Four respondents answered that they used the direct data entry possibility and four respondents answered that they used the file upload module. One respondent did not make a choice between these two possibilities of data entering.

Thirty-two questions were formulated to collect information about using the registry, about the look and feel and about the practicalities using the registry (Annex IV).

11.3.1 Experiences using the registry: Results of the questionnaire

11.3.1.1 Logging on to the registry and using the instructions

No respondents experienced any problems logging in to the pilot registry. Two instruction files were available; one for the direct data entry possibility (Annex V) and one for the file upload module (Annex VI). Answers to the questionnaire show that 3 out of 9 respondents experienced difficulties using the ACCORD WP4 pilot registry. A specification of this answer was given by all three respondents. They specified the difficulty as follows:

- Difficulty understanding the instructions
- Difficulty finding an answer to a question
- Other, specify:
  - There were some mistakes in the instruction file
  - At the first moment can't save the number of data with 'O', like blood type. But at the end everything goes fine.

11.3.1.2 Look and feel of the registry

Once logged in to the pilot registry application, the user can either register a new donor, download data or import data (depending on the user's authorization). The respondents all agreed on the fact that the registry felt intuitive. It was easy to find the way around the application. Eight respondents (88.9%) said 'Yes' to the question 'Did you recognize the application as the ACCORD WP4 pilot registry?'. One respondent specified the answer 'No' by giving a suggestion to improve the look and feel of the application by adding headings to the applications that it is the ACCORD database.

11.3.1.3 Permission to use donor follow-up data

Two of the respondents said that their national legislation prescribes to ask permission to all living donors whose (anonymized) follow-up data is included in the ACCORD WP4 pilot registry. This means that by far the most respondents live in a country where (anonymized) data can be collected in a(n international) (pilot) registry without the condition to ask specific permission to the donor. Even the countries that needed consent from the living donors to use their data in the ACCORD WP4 pilot registry experienced no problems to obtain this permission. This is an interesting outcome, keeping in mind one of the main goals of a(n international) registry to collect large amounts of anonymized data for research purposes.

11.3.1.4 Direct data entry

Four respondents (44.4%) entered data by direct key entry. Due to the almost equal distribution of respondents who used the possibility of direct key entry and the possibility of file upload, a good insight in the experiences using both functionalities was given.

Of the four respondents that used the direct key entry possibility, one experienced difficulties in completing the donor demographic information. Three respondents experienced difficulties in completing the follow-up data. Specification of this outcome gave insight in these difficulties:

- Difficulty to obtain items with a different unit (1 respondent)
- Difficulty to obtain the specified items from the donor's file (3 respondents)

Main problem that both users faced was the fact that the data that was asked, was not collected in the donor files in the transplant centres. For example the donor's weight was collected as baseline information, but is only collected in the follow-up "if something goes wrong with the patient", replied this respondent.

11.3.1.5 File upload

The file upload module was also used by four respondents (44.4%). No respondents using the file upload module had problems extracting the data from their existing (national) registry. They did however have to convert items from their existing registry to make it compatible with the ACCORD definitions and values. Three respondents that used the file upload module had problems with the conversion of the data from their existing registry. A specification of these difficulties was given:

- Different definitions are used (25%)
- Different values are used with difficulties to calculate into other values (8.3%)
- A large number of missing values in existing registry (25%)
- Difficulty to merge the downloaded data from the existing registry into the ACCORD upload file format (16.6%)
- Very time consuming (25%)

One respondent motivated: "Very time consuming because definitions were sometimes completely different and therefore complicated translations had to be carried out".

The experience in working with the upload file and module was motivated in a free-text box in the online questionnaire. Respondents had to adjust the extracted data from the existing registries to

fit the ACCORD WP4 pilot template. When a file was uploaded and it contained invalid values or other errors as defined in the pilot registry, a notification popped-up. One country has recorded the syntax for recoding the variables, to anticipate on a future situation in which the system might be implemented. Another country has harmonized the ACCORD WP4 data set with the data set of the existing national registry. This was done by creating a new data set for the national registry according to the ACCORD data set (for the future) and to merge the national data into the ACCORD WP4 pilot items (for the pilot). An important outcome of the pilot was that the module could not process a large number (>350) of donor follow-up data at once. This meant that the data needed to be split into multiple spreadsheets to upload it. This was a drawback since the data upload, as a result of this, took more time than expected. One respondent suggests making the headings in the upload template clearer, since the headings were not always easy to interpret with the given number (for example P32) instead of the name of the item (date of donation).

11.3.1.6 Data download

Six users (66.7%) did not make an extraction of their 'own' data. Therefore, the conclusion concerning the data download possibility can only be drawn from three respondents. Two out of the three respondents that made an extraction of their data, and checked whether the downloaded data were identical to the data they entered / uploaded. One respondent found no discrepancies in the data. One respondent found a difference in gender. This mistake appeared in the download file and was easy to correct (with support from the Hospital Clinic of Barcelona).

11.3.1.7 General opinion and suggestions for improvement

It is concluded that the ACCORD WP4 pilot registry is a good tool for countries without a (digital) follow-up registry. One respondent answered that the country has legal acts for living donation and follow-up after kidney donation, but transplant centres still could not ensure all the data to the pilot database. One respondent emphasized the difficulty to complete the item 'proteinuria' in the pre-donation as well as the post-donation situation. "PCR (Protein Creatinine Ratio) values (in mg/mmol creat) of the respondent's patients were all far out of the ACCORD reference values (0-0.08 mg/mmol creat). The range of our values was 3.6-19.0; in accordance with international values for PCR".

Conclusion:

- The ACCORD WP4 pilot registry is a suitable way to collect living donor follow-up information.
- Direct data entry and file upload are both good possibilities to enter data into the registry.
- The data download functionality worked well and is a good possibility for countries to extract their own data.
- The size of the upload file (number of records to be uploaded in one shift) was limited due to a technical setting in the application. This can easily be adapted.
- The headings in the upload template are not easily identifiable (numbers are used as a reference instead of the column title).
- Users responded that they were faced with a lot of missing values in the patient's medical files.

11.4 Technical evaluation

In the contract between the Dutch Transplant Foundation and the Hospital Clinic of Barcelona the data, practical and technical evaluations were specified. Since Hospital Clinic of Barcelona performed the technical support and facilitated the ACCORD WP4 pilot registry, they were asked for their experiences and feedback on positive results and difficulties they faced in the technical support and database facilitation. Of course, the feedback of the nine countries that were involved in the direct data entry and file upload, is also processed in the following chapter.

11.4.1 Adjustments in existing EULID application

The EULID application is a tool that has been working properly for over 7 years already. The technicians involved in the ACCORD WP4 pilot are very experienced in working with the EULID registry. Some adaptations had to be made in the registry however, to make it fit the ACCORD specifications, data set and data definitions. Beside this, the upload module was no part of the EULID registry and one of the most important prerequisites for the ACCORD WP4 pilot registry. This module had to be developed for the ACCORD WP4 pilot registry.

As mentioned, the ACCORD data set and dictionary differs from the data set that was already processed in the running application. Therefore, adaptations had to be made. Hospital Clinic of Barcelona has had no problems processing these adaptations. Many correspondence and deliberation took place between the WP4 leader and Hospital Clinic of Barcelona. For example, Hospital Clinic of Barcelona suggested to only collect the date of birth, as age can then be calculated, as well as collecting the date of discharge, as this can be used for calculating for example 'length of hospital stay'. Since the items in the data set were agreed upon by the WP4 project group, the abovementioned suggestions were denied. Not every country collects for example the date of birth which would make it difficult to collect this item for the pilot. Another suggestion was to set unknown values as code 'Null'. If the option unknown would be referred to as a certain value, this will lead to miscalculations in the analysis. This suggestion was accepted. Some other items led to questions to Hospital Clinic of Barcelona, but solutions were always easily found and applied without any problems.

Hospital Clinic of Barcelona had implemented a codification system to trace and place items in the corresponding places in the database. Even though this codification was different from the codes that were given in the ACCORD WP4 data set, it was agreed upon to use the codification for the pilot that had already been established.

Some conversion–tools were integrated in the ACCORD WP4 pilot registry.
These were for example:
> Weight: kg ↔ pounds (lb)
> Height: cm ↔ inches
> Creatinine: (umol/L ↔ mg/dl)

All adaptations were done within very acceptable time periods. When adaptations were ready to be tested, Hospital Clinic of Barcelona informed the Dutch Transplant Foundations and acceptance tests were performed to check the result of the modification and the impact of the changes on the system.

11.4.2 Authorizations and standards

One of the prerequisites of a living donor follow-up registry, defined by the WP4 project group was that the registry needed to be an online application, approachable by all common browsers. The Dutch Transplant Foundation has reported several problems logging in to the registry, using Internet Explorer. The problems could not be reproduced by the Barcelona database specialist, but it was suggested to use another browser. Google Chrome caused no problems. According to Hospital Clinic Barcelona, the registry has been tested in several browsers (Internet Explorer, Chrome, Firefox, Safari, etc.) and platforms (windows, android, and Apple iOS) and this worked well. It is recommended to use the latest versions of browsers. Chrome and Firefox are able to update themselves, but this process needs to be done manually for Internet Explorer. This could be an acceptable explanation.

As described in Chapters 7 and 8, different levels of authorization were identified. Depending on the level of authorization, a user can see local, national or global information. Besides this sub-division, the users were also given different authorization to use the registry. The countries that were to use the direct data entry possibility had no button to use the file upload possibility.

Once donors were entered into the database, it was possible to make adjustments in the donor's data, regardless of the way that was used to enter the donor's information into the registry. The registry keeps track of changes that are made and links these changes to the username that performed the actions. In Chapter 7 the possibility of changing the language to the native language of the user, driven by the browser's configuration was mentioned. This aspect was not a part of the ACCORD WP4 pilot, but could still be recommended for a future RoR.

11.4.3 Technical evaluation of direct data entry

The direct data entry function was already a part of the EULID registry and only needed minor adjustments. Donor demographic information needed to be completed first. The registry automatically generated a unique identification code to the donor. After the donor was entered in the registry, the peri- and postoperative data could be completed as well as the follow-up data. Users reported only one difficulty using the direct data entry possibility. It turned out that it was impossible to choose blood type '0' (numeric). Solution to this problem was to choose 'O' (symbol) instead. Besides this, no problems were reported.

11.4.4 Technical evaluation of file upload module

Data had to be uploaded from an existing registry. The items from the existing registries had to fit the values that were defined by the WP project group. Besides possible adaptations in the values, the data needed to fit the template file that was developed by Hospital Clinic of Barcelona. The template file assures that all the items that are uploaded, correspond with the correct cell in the database. Some respondents that completed the questionnaire reported that once they had converted the data from the existing registry, it was another challenge to create the template file. Other countries experienced no difficulty matching the predefined format in the template file. In contrary to the direct data entry, it is not necessary to upload the donor demographic information apart from the follow-up data. All data can be uploaded in the single template file. The data that are uploaded via the module are easily identified by a batch-number that is given to the uploaded file.

A remark that was made concerning the template was that the headers contained 'codes or numbers' as a title. This made it difficult to understand what data was collected in a certain column. It was advised to add header titles that can easily be interpreted.

From the questionnaire we learned that it was not possible to upload large amount of data at once. Apparently no warning was given at the time of the upload, but when the user looked at the data, it only showed around 300 donors. To enter the rest of the donors, the data was split in several groups with smaller amounts and each file was imported separately. This user experienced that the application imported varied amounts each time. Sometimes it would allow over 300 and other times slightly less. This situation was not reported to the Dutch Transplant Foundation nor to the Hospital Clinic of Barcelona during the pilot itself, so no support was given at the time of occurrence. It turned out that, in order to protect the system, the registry has limited the size of the file to upload, but this limit can be modified if required. If the situation had been reported during the pilot, the maximum amount of data to upload at once would have been increased by Hospital Clinic of Barcelona.

11.4.5 Technical evaluation of data download

Three authorization levels were identified for the data download possibility. These are:

- Local: the user can only extract the data from the own centre from the database
- National: the user can download all the data from their own country.
- Global: the user can extract all the data that was entered or uploaded by all countries.

For the pilot registry, the users from eight countries were given national authorization to download all the data for their own country. The Dutch Transplant Foundation, as project leader, was given authorization to download all the data that was entered, enabling data analysis. It turned out that only three users used the data download possibility. There were two different sets of data to download:

- Donor data: this includes the donor demographic information
- Survey data: this includes the pre-, peri- and post-operative data set that is defined by the ACCORD WP4 project group.

Data downloaded is presented in an Excel file. During the data evaluation and analysis, it was found that there was a problem with the conversion of data, using dots (.) and commas (,). This file led to false results. Feedback from the Hospital Clinic of Barcelona learned that this problem was a result of the interpretation that Excel gave to the data extracted from the registry. The decimal point used in the registry for numeric values is '.' but Excel is interpreting this in several European countries as the thousands separator. Different countries, but also different computers use different notations, which are hard to change in the correct format. During the pilot it was not possible to make proper changes to the system to avoid these inconveniences. Another problem with the download file is that all fields are set to 'general' instead of the proper types like 'numeric' or 'date'. This makes the processing of the download file for statistical purposes very laborious.

Conclusion:

- The follow-up registry (of registries) as an online application functioned well.
- The concept of a web-based application proved to be very useful, and can be recommended.
- The pilot can be approached by all common browsers, preferably using the latest version. Internet Explorer is less convenient to use, because updates are not installed automatically and could therefore cause difficulties when running the registry using Internet Explorer.
- The installation of a support team that responded to any technical difficulties within a short period of time, was very valuable.
- The file for uploading data from an existing registry had a predefined template which was easy to use. Conversion had to take place of data from existing registries into the ACCORD pilot registry.
- Countries were able to download their 'own' data in an Excel file as this was part of their user profile's authorization. However, special caution should be paid to the 'decimal separator'.

12. Data and Process Evaluation

To present the results of the data evaluation in a synoptic way, the next chapter will focus solely on the data analysis and the consequences for the health of living kidney donors, one year after donation, in 9 participating countries. The analyses that have been performed were agreed upon by all WP4 partners in the Pilot Evaluation Plan (ref: 21367-1_kol).

12.1 Pilot specifications

According to the pre-set outlines of the pilot, information of donors who donated a kidney in 2010 and 2011 was collected. Of these donors, the pre-donation data, the peri-donation data, and the one-year follow-up information is included, according to the predefined ACCORD pilot data set and data dictionary Registry of registries KIDNEY (Annex III). Data could be included in the pilot database in two different ways:

1. Key entry of data
   The participants of this part of the pilot are shown in Table 14. The expected number of donors by key entry based on the Newsletter Transplant 2011 and 2012 was 163 donors.

Table 14. Participants of the pilot with key entry and number of living kidney donors as recorded in the Newsletter Transplant 2011 and 2012.

Direct data entry			
Country	Number of living kidney donors in 2010 Newsletter Transplant 2011	Number of living kidney donors in 2011 Newsletter Transplant 2012	Number of living kidney donors in 2010 and 2011 Newsletter Transplant 2011+2012
Croatia	20	9	29
Latvia	2	3	5
Lithuania	8	3	11
Portugal	51	47	98
Slovak Republic	7	13	20
Sub Total	**88**	**75**	**163**

2. File upload
   The participants of this part of the pilot are shown in Table 15. The expected number of donors by file upload, based on the Newsletter Transplant 2011 and 2012 was 3,607 donors. The countries who participated in the file upload part of the pilot already have a national or local follow-up database in place.

Table 15. Participants of the pilot with file upload and number of living kidney donors as recorded in the Newsletter Transplant 2011 and 2012.

File upload			
Country	Number of living kidney donors in 2010 Newsletter Transplant 2011	Number of living kidney donors in 2011 Newsletter Transplant 2012	Number of living kidney donors in 2010 and 2011 Newsletter Transplant 2011+2012
The Netherlands	473	440	913
Poland	50	40	90
Spain	240	312	552
United Kingdom	1,026	1,026	2,052
Sub Total	**1,789**	**1,818**	**3,607**

12.2 General outcome

The total number of donors included in the pilot was 2,921 donors. Two donors were excluded because only a donation number was given, while all other data was missing. Ten were excluded because of problems with the donation date (should be between 1-1-2010 and 1-1-2012): in 6 cases no donation date was entered and in 4 cases the donation date was outside the predefined borders. Finally the analysis was done with the remaining 2,909 donors, which corresponds with 77% of the total number of living donors in 2010 and 2011 in the participating countries.

In table 16 the data are shown of the participating countries. The United Kingdom had by far the largest number of living kidney donors (70.4% of all included donors). In the last column of table 16 the percentage is shown of the number of included donors in relation to the expected number of donors. The expected number of donors was based on the total number of living donors as provided in the Newsletter Transplant 2011 and 2012. Three countries, participating in the key entry pilot included 100% of the expected number of donors. Portugal and Croatia included 39.8% and 51.7% of the expected number respectively. Two countries which entered data by file upload had 100% and nearly 100% of the expected number of donors. The other two countries (The Netherlands and Spain) with upload entry had a percentage of inclusion of expected donors that ranged from 36.9% to 62.1%. Particularly The Netherlands had a very low percentage (36.9%). Interesting additional information is whether this low percentage is the result of problems using the upload module or that the donors were not included in the national database. Further analysis proved that for The Netherlands both possibilities were true. In the Dutch database 663 donors had sufficient follow-up, but due to a limitation error in the upload module the number of donors that could be uploaded in one shift was restricted and only 337 were included in the ACCORD database. This remark was also mentioned in the questionnaire by the UK who had noticed it during the process of file upload. On the other hand in the Dutch national database 250 donors had insufficient follow-up data, and could not be uploaded at all. In Spain all available donors with sufficient follow-up data were included in the ACCORD database. It should be emphasized that in both countries basic data are available for 100% of the donors. However, both countries only uploaded donors when both baseline and follow-up data were available.

Table 16. Number of donors included in the ACCORD pilot registry according to country

Country	Number of donors	Percentage of the total included donors	% of expected*
Spain	343	11.8	62.1
United Kingdom	2,049	70.4	99.8
Croatia	15	0.5	51.7
Lithuania	11	0.4	100
Latvia	5	0.2	100
The Netherlands	337	11.6	36.9
Poland	90	3.1	100
Portugal	39	1.3	39.8
Slovak Republic	20	0.7	100
Total	**2,909**	**100**	

*Based on the total number of living donors as reported in the Newsletter Transplant 2011 and 2012

Conclusion:

The entry of donors, either by key entry or by file upload did technically not give many problems. The upload module had a limitation for the number of donors that could be included in one time, which resulted in a loss of donors from the Netherlands. The incompleteness of the national or local databases was another important reason for the reported low number of included donors.

12.3 Characteristics of the pre-donation data

The donor characteristics before donation are shown in Table 17. The age of the donor at the moment of donation ranged from 18 (minimal allowed age for donation) to 82 years, with a mean age of 47 years. More women than men donated a kidney, which was also the outcome in each individual country. The mean Body Mass Index (BMI) was slightly above 25 kg/m2. In case the length was below 120 cm the value was set to 'unknown'. In case the weight was below 40 kg or above 140 kg the value was also set to 'unknown'. The most frequent blood group was O as can be expected in a living donation situation (universal donor). The most common ethnicity was white (86.3%). The ethnicity was the item in the pre-donation evaluation with the most missing values (26.9%). Several countries did not collect this item, which is also not mandatory in the ACCORD database.

Table 17. Characteristics of the donor (missing values excluded from analysis)

Variable name		Lowest value	Highest value	Percentage missing values
Age (yr); mean ± sd	47.4 ± 12.0	18	82	0.1
Gender (male);%	43.4	-	-	0
Weight (kg); mean ± sd	75.4 ± 14.0	39.5	140	7.7
Height (cm); mean ± sd	168 ± 9.9	122	198	10.3
Blood group; %				1.5
> A	34.3	-	-	
> AB	0.7	-	-	
> B	9.2	-	-	
> O	55.8	-	-	
Ethnicity; %				26.9
> Asian	7.5	-	-	
> Black	4.4	-	-	
> Mixed	0.3	-	-	
> Oriental	0.5	-	-	
> White	86.3	-	-	
> Other	0.9	-	-	

Additional pre-donation data are shown in Table 18. The relation between donor and recipient was almost always available and in the majority of cases genetically related (>60%). The pre-donation antihypertensive treatment counted many missing values (77.1%), because this item was not present in many countries. From Table 18 it is clear that if this item was completed, less than 10% of the donors used antihypertensive medication before donation. The mean serum creatinine value before donation was 74 µmol/L with a low standard deviation as can be expected in this population. The highest value was 158 µmol/L. In some cases the value of the serum creatinine had to be divided with 10,000 because some countries experienced problems with the conversion of units. In one case the serum creatinine before the donation procedure was 541 µmol/L, while this was 64 µmol/L after the donation. This serum creatinine was adjusted to 54.1 µmol/L. Very few countries had the item proteinuria before donation in its database, so this item is almost always missing. The main reason why proteinuria is missing was the ACCORD database format. Many countries used other formats and could therefore not include this item in a proper way. The comorbidity in the pre-donation phase was also rather low, as can be expected in this group of donors. In the dataset the comorbidities were predefined. These comorbidities could be completed with Yes or No. It can be concluded that most comorbidities were referred to as 'other'. Further analysis of the item 'other' revealed that some countries had filled out all comorbidity in the item 'other', and did not translate the actual comorbidity to the correct ACCORD item. Additional analyses made clear that most items could be categorized into predefined ACCORD items. Table 19 shows the distribution of the items 'other' into the predefined ACCORD items. Pre-donation cardiovascular problems were the most frequent mentioned item of the predefined ACCORD items, followed by respiratory problems.

Table 18. Data before donation (missing values excluded from the analysis)

		Lowest value	Highest value	% missing values
Relation type (%)				1.3
> Related genetically (%)	61.4	-	-	
> Related non-genetically (%)	26.9	-	-	
> Unrelated (%)	11.7	-	-	
Antihypertensive treatment (%)				77.1
> Nothing (%)	91.6			
> Diet only (%)	0			
> Medication (%)	8.4			
> Other treatment (%)	0			
Antihypertensive treatment (%)				
> Diuretic (%)	13.6			
> Beta blocker (%)	38.1			
> ACE inhibitor (%)	12.9			
> A2 antagonist (%)	24.6			
> Vasodilator (%)	13.3			
> Other medication (%)	0			
> Two or more treatments (%)	19.6			
Creatinine (µmol/L); mean ± sd	74 ± 14	37	158	7.2
Proteinuria (mg/mmol Creat); mean ± sd	1.5 ± 3.9	0	19.0	98.5
Comorbidity (Y) %	8.6			15.6
> Abdominal surgery (%)	0.2			
> Malignancy (%)	0			
> Hematology (%)	0			
> Neurology (%)	0			
> Cardiovascular (%)	0.2			
> Respiratory (%)	0.1			
> Gastroenterology (%)	0.1			
> Psychology (%)	0.1			
> Renal (%)	0			
> Other (%)	8.0			

Table 19. The item 'other' in comorbidity. Breakdown in predefined ACCORD items**

ACCORD item	Frequency
Other	77
Cardiovascular	69*
Respiratory	39
Psychology	17
Unreadable	8
Hematology	6
Renal	6
Abdominal surgery	3
Neurology	3
Malignancy	0
Gastroenterology	0

*including hypertension
**donor can have more than one comorbidity

Conclusion:

- Except for the pre-donation antihypertensive treatment and the pre-donation proteinuria, most predefined ACCORD items were available in the pilot registry.
- The reported values are for most items within the expected range.
- The predefined comorbidity items were not specified to the ACCORD subdivision, and mostly 'Other' is chosen. Particularly the countries which entered data by file upload had problems to include their comorbidity in the predefined ACCORD items. Further analysis revealed that, although laborious, their data could be transferred to the correct ACCORD items.
- Some conversion problems with the creatinine value were encountered.

12.4 Data during the donation procedure (from donation until discharge)

The data of the donation procedure are shown in Table 20. The mean length of stay in the hospital was 4.2 days, which is rather short, particularly because open procedures were also included in this average number. In three cases the length of stay was more than one year. In these cases the value was set to 'unknown'. The item about admission to the ICU was almost never available in the participating countries. The majority of donated kidneys were left kidneys, as can be expected because of the longer veins. In the investigation period (2010 and 2011) most donation procedures were laparoscopic and in only 10% of the cases an open procedure was performed. The item 'complications during the donation procedure' was not completed in more than 35% of the cases. This is remarkable, because one would expect that this is one of the key items for a living donor registry. When the item was filled out, it was clear that the percentage of complications during operation is very low, and the items that were mentioned were mostly a switch from laparoscopic to open procedure and blood loss. These can be considered as not very complicated side effects of the operation procedure.

Table 20. Data during the donation procedure (missing values excluded from the analysis)

		Lowest value	Highest value	% missing values
Length of hospital stay (days); mean ± sd	4.2 ± 2.5	1	36	20.2
Number of days in ICU; mean ± sd	0.09 ± 0.3	0	1	99.0
Left kidney donated; %	84	-	-	12.0
Operation technique; %		-	-	8.3
> Open (costal resection) %	0.4	-	-	
> Open (no costal resection) %	8.5	-	-	
> Open (mini incision) %	3.2	-	-	
> Laparoscopic (standard) %	45.8	-	-	
> Laparoscopic (hand assisted) %	42.0	-	-	
> Other %	0	-	-	
Complications during operation (Y); %*	3.0	-	-	35.9
> Blood loss %	1.3	-	-	
> Kidney damaged %	0	-	-	
> Other organ damaged %	0	-	-	
> Switch of laparoscopic procedure %	1.6	-	-	
> Cardiac arrest %	0	-	-	
> Other severe complications %	1.3	-	-	

*one donor can have more than one complication

Some additional data about complications during the first admission until discharge are shown in Table 21. This item was completed in more than 90% of the cases. Also in this data the percentage of complications during admission is about 10%. Remarkable in this case as well, was that most of the time the item 'other' was chosen and not one of the pre-defined ACCORD items. The 'complications during donation' and 'until discharge' were combined, which resulted in a complication percentage of 15.9%.

Table 21. Early complications after donation (before discharge; missing values excluded from the analysis)

		Lowest value	Highest value	% missing values
Complications (Y) %**	10.1	-	-	9.7
> Blood loss %	0.2	-	-	
> Re-operation %	0.8	-	-	
> Infection %	1.9	-	-	
> Thrombo/embolic %	0.4	-	-	
> Dialysis %	0	-	-	
> Cardiac arrest %	0	-	-	
> Other %	9.0	-	-	
Combined complications (Y) % (operation until discharge)*	15.9			34.7

* If either complication during operation or early complication after donation is YES then the combined item is YES. If no complication was recorded neither in complication during operation or early complication after donation then the combined item is NO. If in the complication during operation or early complication after donation one item is missing and the other value is NO then the combined value is set to missing.
** One donor can have more than one complication

Analyzing the complication item 'other' again led to the conclusion that some countries have registered the complications not according to the ACCORD items, but registered all items under the item 'other'. Table 22 shows an overview of the distribution of the item 'other'.

Table 22. Early complications after donation (before discharge). Breakdown in predefined ACCORD items.

ACCORD item	Frequency
Infection	66*
Other	40
Blood loss	4
Thrombo/embolic	2
Dialysis	0
Cardiac arrest	0
Re-operation	0
Unreadable	49
Wound problems	18
Pain	14
Readmission	10
Fever	8
Ileus	6
Urinary retention	6
Splenectomy	6
Bowel injury	4
Fatigue	4
Nerve injury	4

*mainly respiratory infections

Several complications were not written in English, and are depicted here as 'unreadable'. Some complications in Table 22 are not very severe and it is questionable whether these complications should be included at all. Examples of this are fatigue, urinary retention, fever, pain. The complication 'readmission' is also questionable because the follow-up is until the first discharge. Other complications are severe, like splenectomy, bowel injury and ileus. Two important conclusions can be drawn from Table 22: firstly, that the complications that were filled out as 'other' could be easily classified in the predefined ACCORD items. Adding, deleting or replacing predefined ACCORD items is therefore not necessary. Secondly, to avoid discussions about which complications are severe enough to be listed in the RoR, only SAE (serious adverse events) should be included according to international definitions. Several guidelines are suitable for this purpose and during the implementation of the RoR a selection should be made.

Conclusion:

- Most data are completed except for the number of admission days on the ICU.
- Data are in line with expectations for the items 'side of the kidney', and 'complications during donation procedure till discharge'.
- Many complications were rated as 'other' and not sub-categorized according to the proper 'ACCORD standard'.
- No extra classifications within the complications categories are necessary, because with some effort all complications could be classified in predefined ACCORD items.
- The definition of complications should be adapted to international standards to avoid the registration of minor problems.
- The length of hospital stay was rather short with an average stay of 4 days.

12.5 Follow-up from discharge until 1 year after donation

The follow-up was set at one year. That means that morbidity or mortality after one year is not included in this analysis. The data about follow-up are depicted in Table 23 Two donors died in the predefined follow-up period 2.4 and 3.0 months after donation. One donor died suddenly as a result of circulatory problems, the other died in a car accident.

The antihypertensive treatment was reported in much more cases than in the pre-donation phase, but is not available in several countries. Only 2% of the donors used antihypertensive drugs after donation and nearly no one used more than one drug. The mean creatinine value was 105 µmol/L and this is of course higher than the pre-donation values for creatinine. Remarkably enough, the item proteinuria is still not completed very frequently. Additional search for the reasons why this important item is missing revealed that proteinuria was available in all databases, but not in the units that were defined by the ACCORD group. Sometimes it is available as 'no' and not as a number; sometimes it is only available as gram per day or gram per litre. These units could not be easily translated to the ACCORD units. During the one-year follow-up we also counted the health issues of the donors and surprisingly this item was often missing. For the donors where this item was filled in it became clear that the incidence of health issues is very low.

No donors needed dialysis in the year after donation. The item 'did the donor return to his or her previous activities' was answered with Yes in the great majority of the cases. The mean value for the return to previous activities was 2.5 months.

Table 23. Follow-up from discharge to 1 year after donation (missing values excluded from the analysis).

		Lowest value	Highest value	% missing values
Donor lost to follow-up %	24.0	-	-	6.1
Death within 1 year (Y) N	2	-	-	
Mean death interval after donation (months)	2.7	2.4	3.0	
Weight of the donor (kg); mean ± sd	75.9 ± 14.0	39.5	140.0	18
Antihypertensive treatment		-	-	29.3
> Nothing %	92.9	-	-	
> Diet only %	0	-	-	
> Medication %	3	-	-	
> Other medication %	4.1	-	-	
Antihypertensive treatment				
> Diuretic %	34.0	-	-	-
> Beta blocker %	56.0	-	-	-
> ACE inhibitor %	28.8	-	-	-
> A2 antagonist %	36.2	-	-	-
> Vasodilator %	27.7	-	-	-
> Other %	NA	-	-	-
> Two or more treatments (%)	9.5			
Creatinine (µmol/L); mean ± sd	104.9 ± 21.4	46	189	29.8
Proteinuria (mg/mmol Creat); mean ± sd	4.1 ± 11.1	0	80	93.4
Health issues (Y) %*	20.2			91.8
> Abdominal surgery %	0	-	-	
> Malignancy %	0.4	-	-	
> Hematology %	0	-	-	
> Neurology %	0.4	-	-	
> Cardiovascular %	0.4	-	-	
> Respiratory %	0	-	-	
> Gastro intestinal %	0	-	-	
> Psychiatry %	0.4	-	-	
> Psychology %	0	-	-	
> Renal %	1.2	-	-	
> Renal replacement therapy %	0	-	-	
> Pregnancy %	0	-	-	
> Diabetes mellitus %	0	-	-	
> Other %	2.9	-	-	
Did the donor return to previous activity level (Y); %	98.2	-	-	42.0
Return to previous activity (months); mean ± sd	2.5 ± 1.7	1	12	53.5

* for several donors no specification of the health issue was filled out.

Conclusion:

- 2 deaths were encountered in the first year after donation, which makes the death rate within one year 0.07%. The deaths were not related to the donation procedure. No deaths were reported in the immediate postoperative phase.
- No donors needed renal replacement therapy during follow-up.
- In the one-year follow-up period few donors used antihypertensive drugs and few donors were reported with health issues.
- The great majority of the donors returned to pre-donation activities within 3 months after donation.
- Proteinuria was registered in the RoR during follow-up very infrequently, because of different units in different countries. Because this item is important for the follow-up of the donor, the units for the ACCORD items should therefore be reconsidered.

13. General Conclusions of the Pilot

To give a short overview of all the conclusions that are drawn in the previous chapters, all conclusions are listed below. A summary of the conclusion is given in the second paragraph.

13.1 Overview of conclusions

13.1.1 Pilot evaluation

- The ACCORD WP4 pilot registry is a suitable way to collect living donor follow-up information.
- Direct data entry and file upload are both good possibilities to enter data into the registry.
- The data download functionality worked well and is a good possibility for countries to extract their own data.
- The size of the upload file (number of records to be uploaded in one shift) was limited due to a technical setting in the application. This can easily be adapted.
- The headings in the upload template are not easily identifiable (numbers are used as a reference instead of the column title).
- Users responded that they were faced with a lot of missing values in the donor's medical files.

13.1.2 Technical evaluation

- The follow-up registry (of registries) as an online application functioned well.
- The concept of a web-based application proved to be very useful, and can be recommended.
- The pilot can be approached by all common browsers, preferably using the latest version. Internet Explorer is less convenient to use, because updates are not installed automatically and could therefore cause difficulties when running the registry using Internet Explorer.
- The installation of a support team that responded to any technical difficulties within a short period of time, was very valuable.
- The file for uploading data from an existing registry had a predefined template which was easy to use. Conversion had to take place of data from existing registries into the ACCORD pilot registry.
- Countries were able to download their 'own' data in an Excel file as this was part of their user profile's authorization. However, special caution should be paid to the 'decimal separator'.

13.1.3 General outcome

The entry of donors, either by key entry or by file upload did technically not give many problems. The upload module had a limitation for the number of donors that could be included in one time, which resulted in a loss of donors from the Netherlands. The incompleteness of the national or local databases was another important reason for the reported low number of included donors.

13.1.4 Characteristics of the pre-donation data

- Except for the pre-donation antihypertensive treatment and the pre-donation proteinuria, most predefined ACCORD items were available in the pilot registry.
- The reported values are for most items within the expected range.
- The predefined comorbidity items were not specified to the ACCORD subdivision, and mostly 'Other' is chosen. Particularly the countries which entered data by file upload had problems to include their comorbidity in the predefined ACCORD items. Further analysis revealed that, although laborious, their data could be transferred to the correct ACCORD items.
- Some conversion problems with the creatinine value were encountered.

13.1.5 Data during the donation procedure

- Most data are completed except for the number of admission days on the ICU.
- Data are in line with expectations for the items 'side of the kidney', and 'complications during donation procedure till discharge'.
- Many complications were rated as 'other' and not sub-categorized according to the proper 'ACCORD standard'.
- No extra classifications within the complications categories are necessary, because with some effort all complications could be classified in predefined ACCORD items.
- The definition of complications should be adapted to international standards to avoid the registration of minor problems.
- The length of hospital stay was rather short with an average stay of 4 days.

13.1.6 Follow-up from discharge until one year after donation

- 2 deaths were encountered in the first year after donation, which makes the death rate within one year 0.07%. The deaths were not related to the donation procedure. No deaths were reported in the immediate postoperative phase.
- No donors needed renal replacement therapy during follow-up.
- In the one-year follow-up period few donors used antihypertensive drugs and few donors were reported with health issues.
- The great majority of the donors returned to pre-donation activities within 3 months after donation.
- Proteinuria was registered in the RoR during follow-up very infrequently, because of different units in different countries. Because this item is important for the follow-up of the donor, the units for the ACCORD items should therefore be reconsidered.

13.2 Summary of conclusions

This evaluation provides very valuable information. It can be concluded that a pilot version of a registry of registries can be established by the facilitation of an online application. Any modifications in the online application can be easily made, enabling all countries to have the latest (and best functioning) version at their disposal. The direct key entry possibility as well as the file upload possibility were very suitable ways for countries to enter their living donor's follow-up information. However, the conversion of data from an existing database into the ACCORD format was very time-consuming. The consequence of this was that not all items were filled out in the proper predefined ACCORD items. The pilot shows that central registration is absolutely necessary. An alternative would be to send national data to a central European database periodically

(for instance once in the three years), where analysis can be done. The pilot shows that with the current national databases that is impossible. This would only be an option if all countries use exactly the same items and the same definitions in their national databases.

The number of records to be uploaded at once using the upload file was limited due to a technical setting in the application. This became clear during the evaluation so it was not adapted during the pilot, but this setting can easily be changed. The expected number of living donor follow-up records was higher than the actual number of 2909 donors. The incompleteness of the data in the donor's charts as well as in the existing national databases and the limitation of the number of uploaded donors were the main reasons for the discrepancy in the expected and the actual number of living donor follow-up data.

With this pilot it is impossible to conclude about the long-term consequences of living donation, since only one year follow-up data is included. It is still difficult to draw absolute conclusions about the consequences of living donation for a living donor within the European Union after one year, from the data that is collected in the ACCORD WP4 pilot registry. From the data that were collected in the ACCORD pilot registry, we can learn that few severe early complications were reported (splenectomy, bowel injury). Two deaths were reported, but these were not related to the kidney donation procedure. No donors needed renal replacement therapy after donation. It seems as if the donors returned to their previous activity level within 3 months and without facing large problems after donating one of their kidneys.

14. Recommendations

The experiences during the ACCORD WP4 project, including the pilot registry and the analysis of the data result in the conclusions as presented in the previous chapter. The following recommendations result from these conclusions:

- A **common** data **set** and data **definitions** are essential for an international registry, enabling (international) data analysis (Chapter 15);
- Appropriate **governance arrangements** should be in place (as detailed in Chapter 8);
- The **new database** for the collection of follow-up data of living donors should be a **web-based application**;
- The web-based application should have the possibility of **direct data entry**;
- Countries with a small number of living donors could use the registry of registries as their **national follow-up registry**, using the direct key entry possibility. It should be taken into account that the data set for a national registry is different from the data set for an international registry, so the country should have the **possibility to collect** the data that is set to be necessary on a **national level**;
- The web-based **application** should have an **upload facility**. The size of the upload file (number of records to be uploaded at once) should not be limited;
- **Standardized conversion** rates from **one value** (from an existing registry) to the future registry value should be available;
- The web-based **application** should have a **download facility**, where data can be extracted easily by participating countries;
- Special attention will be needed for the internet browser program of the user, to assure **all web browsers working correctly** with the web-based application.
- A **support** team should be available and respond **within short period** to support in case of any questions and/or problems;
- The **official language** of the web-based application should be **English**, and also commentary fields should be in English;
- When in the future ACCORD database historical items of national database have to be included, some **mandatory** items should **be made optional** to ensure sufficient upload possibilities. Preferably this change from mandatory to optional is temporarily;
- Several **standard reports** should be **available**;
- It is suggested to add an **explanation** about the background, goal and responsible institution or consortium in the **home-page** of the online application;
- The **registry** as well as the upload template and the reports that can be extracted from the registry should contain **clear headings** and logos and should be **recognizable** as being a product of the future follow-up application;
- Donor **centres** should be **obliged** to collect living donor follow-up data in order to ensure sufficient follow-up;
- A **follow-up registry**, based on the ACCORD recommendations, must be **implemented**. A new EU-project to accomplish this should be initiated.

15. Final Data Set and Data Dictionary

Besides the recommendations as listed in the previous chapter, this chapter gives an overview of the final data sets and data dictionary. This is a result of the pilot practice and data analysis. These final data sets are also recommendations from the project. These data sets and data dictionary are adopted in the 'Draft Resolution CM/Res(2015) of the Committee of Ministers to Member States *on Establishing harmonised national living donor registries with a view to facilitating international data sharing'.*

15.1 National registry: KIDNEY

15.1.1 Donor demographic information

Nr.	Item	Definition	Units	Mandatory / Optional
1	Identification (ID number)	The unique identification code that is given by the national authorities to each person.		M
2	Date of birth		DD/MM/YYYY	O
3	Age	Actual age at the time of donation	years, no decimals	M
4	Gender		Male/Female	M
5	Weight		kg, no decimals	M
6	Height		cm, no decimals	M
7	Blood group	Menu: > A > B > 0 > AB	Choosing one from this menu	M
8	Address		Open field	O
9	Country of residence		ISO code 3166	M
10	Nationality		ISO code 3166	M
11	Ethnicity	Menu: > White > Asian > Black > Oriental > Mixed, please specify > Other, please specify	Choosing one from this menu and free text field for 'specify:…..	O

15.1.2 Pre-donation data

Nr.	Item	Definition	Units	Mandatory / Optional
1	Relation type	A living donor has one of the following three possible relationships with the recipient*: > A/ Related > A1/ Genetically related: a. 1st degree genetic relative: parent, sibling, offspring b. 2nd degree genetic relative: e.g. grandparent, grandchild, aunt, uncle, niece, nephew, c. Other than 1st or 2nd degree genetic related, for example cousin > A2/ Emotionally related: Spouse (if not genetically related); in-laws; adopted, friend > B/ Unrelated: non-related = not genetically or emotionally related.	Choosing one from this menu	M
2	Blood pressure	Actual blood pressure (independent of the method of measurement)	mmHg	O
3	Hypertension		Yes / No	O
4	Antihypertensive treatment	Menu: > Nothing > Diet only > Medication: - Diuretics - Beta blockers - ACE blockers - A2 antagonists - Vasodilators/Calcium channel blockers - Other	Choosing one or multiple items from this menu	M
5	Creatinine		Umol/L or mg/dl	M
6	Proteinuria	24 hour urine collection Spot urine in gram per litre Dipstick PCR (protein creatinine ratio)	g/24h g/L Y/N mg/mmol creat	M**
7	Any significant co-morbidity	Menu: > No > Yes, specify: - Abdominal surgery, specify… - Malignancies, specify... - Hematological disease, specify… - Neurological disease, specify… - Cardiovascular disease, specify… - Respiratory disease, specify… - Gastrointestinal disease, specify… - Psychiatric disease, specify… - Psychological disorder, specify… - Renal / urinary tract disease, specify… - Other, specify… > Unknown	Choosing one or multiple from this menu and free text field for 'specify...'	M

* WHO, Global glossary of terms and definitions on Donation and Transplantation
** at least one of these options should be completed

15.1.3 Peri- and post-operative data (until discharge)

Nr.	Item	Definition	Units	Mandatory / Optional
1	Donor hospital (centre) name	List to be built by countries.		M
2	Country of donor hospital	The country in which the donation takes place	ISO code 3166	M
3	Date of donation		DD/MM/YYYY	M
4	Left or right kidney		Left / Right	M
5	Operation technique	Menu: > Open technique - Classic technique - Costal resection - No costal resection - Mini-incision > Laparoscopic - Standard - Hand assisted laparoscopic > Other, specify…	Choosing one from this menu	M
6	Complications during operation	Menu: > No complications > Blood loss: need for transfusion > Kidney damaged during retrieval - Kidney can be used for transplantation - Kidney is discarded for transplantation > Other organ damaged during surgery > Switch from laparoscopic procedure to open technique > Cardiac arrest > Other severe complications (i.e. pneumothorax, anaphylactic reaction) (specify…)	Choosing one or multiple from this menu and free text field for 'specify...'	M
7	Complications after operation – until first discharge	Menu: > No complications > Blood loss: need for transfusion > Need for re-operation > Infection (urinary, wound, other) > Thrombo/embolic complications (DVT, pulmonary embolism) > Renal Replacement Therapy, specify… > Cardiac arrest > Other severe complications (specify…)	Choosing one or multiple from this menu and free text field for 'specify…'	M
8	Length of hospital stay (LOS)	The number of days in hospital during the first admission (from day of surgery until discharge)	Number of days	O
9	Number of days in ICU	The number of days in Intensive Care Unit during the first admission (until discharge)	Number of days	O

15.1.4 Follow-up data

Nr.	Item	Definition	Units	Mandatory / Optional
1	Follow-up centre	List to be built by countries.		M
2	Date of follow-up		DD/MM/YYYY	M
3	Donor lost to follow-up		Yes / No	M
4	Death		Yes / No	M
5	Cause of death	All coding systems are allowed		M
6	Date of death		DD/MM/YYYY	M
7	Weight		kg, no decimals	M
8	Blood pressure	Actual blood pressure (independent of the method of measurement)	mmHg	O
9	Hypertension		Yes / No	O
10	Antihypertensive treatment	Menu: > Nothing > Diet only > Medication: - Diuretics - Beta blockers - ACE blockers - A2 antagonists - Vasodilators/Calcium channel blockers - Other	Choosing one or multiple items from this menu	M
11	Creatinine		Umol/L or mg/dl	M
12	Proteinuria	24 hour collection Spot urine in gram per litre Dipstick PCR (protein creatinine ratio)	g/24h g/L Y/N mg/mmol creat	M*
13	Health issues	Menu: > No > Yes, specify: - Abdominal surgery, specify… - Malignancies, specify... - Hematological disease, specify… - Neurological disease, specify… - Cardiovascular disease, specify… - Respiratory disease, specify… - Gastrointestinal disease, specify… - Psychiatric disease, specify… - Psychological disorder, specify… - Renal / urinary tract disease, specify… - Renal Replacement Therapy, specify… - Pregnancy, specify (when)…. - Diabetes mellitus, specify… - Other, specify… > Unknown	Choosing one or multiple from this menu and free text field for 'specify:...'	M
14	Did the donor return to previous activity level? (This item should only be collected during the 12 month follow-up visit.)	Menu: > Yes, within …. months > No > Unknown	Choosing one from this menu and free text field for ' … months'	O

* at least one of these options should be completed

15.2 Registry of Registries: KIDNEY

15.2.1 Donor demographic information

Nr.	Item	Definition	Units	Mandatory / Optional
1	Identification (ID number, initials)	The unique identification code that is given by the national authorities to each person, or a possibility to collect initials.		M
2	Date of birth		DD/MM/YYYY	O
3	Age	Actual age at the time of donation	years, no decimals	M
4	Gender		Male/Female	M
5	Weight		kg, no decimals	M
6	Height		cm, no decimals	M
7	Blood group	Menu: > A > B > 0 > AB	Choosing one from this menu	M
8	Country of residence		ISO code 3166	M
9	Nationality		ISO code 3166	M
10	Ethnicity	Menu: > White > Asian > Black > Oriental > Mixed, please specify > Other, please specify	Choosing one from this menu and free text field for 'specify:...'	O

15.2.2 Pre-donation data

Nr.	Item	Definition	Units	Mandatory / Optional
1	Relation type	Menu: > Related a. Genetically b. Non-genetically > Unrelated	Choosing one from this menu	M
2	Antihypertensive treatment	Menu: > Nothing > Diet only > Medication: - Diuretics - Beta blockers - ACE blockers - A2 antagonists - Vasodilators/Calcium channel blockers - Other	Choosing one from this menu	M
3	Creatinine		Umol/L or mg/dl	M

4	Proteinuria	24 hour collection Spot urine in gram per litre Dipstick PCR (protein creatinine ratio)	g/24h g/L Y/N mg/mmol creat	M*
5	Any significant co-morbidity	Menu: > No > Yes, specify: - Abdominal surgery, specify… - Malignancies, specify... - Hematological disease, specify… - Neurological disease, specify… - Cardiovascular disease, specify… - Respiratory disease, specify… - Gastrointestinal disease, specify… - Psychiatric disease, specify… - Psychological disorder, specify… - Renal / urinary tract disease, specify… - Other, specify… > Unknown	Choosing one or multiple from this menu and free text field for 'specify:...'	M

* at least one of these options should be completed

15.2.3 Peri- and post-operative data

Nr.	Item	Definition	Units	Mandatory / Optional
1	Country of donor hospital	The country in which the donation takes place	ISO code 3166	M
2	Date of donation		DD/MM/YYYY	M
3	Left or right kidney		Left / Right	M
4	Operation technique	Menu: > Open technique a. Classic technique - Costal resection - No costal resection b. Mini-incision > Laparoscopic a. Standard b. Hand assisted laparoscopic > Other, specify…	Choosing one from this menu	M
5	Complications during operation	Menu: > No complications > Blood loss: need for transfusion > Kidney damaged during retrieval a. Kidney can be used for transplantation b. Kidney is discarded for transplantation > Other organ damaged during surgery > Switch from laparoscopic procedure to open technique > Cardiac arrest > Other severe complications (i.e. pneumothorax, anaphylactic reaction) (specify…)	Choosing one or multiple from this menu and free text field for 'specify...'	M
6	Complications after operation – until first discharge	Menu: > No complications > Blood loss: need for transfusion > Need for re-operation > Infection (urinary, wound, other) > Thrombo/embolic complications (DVT, pulmonary embolism) > Renal Replacement Therapy, specify… > Cardiac arrest > Other severe complications (specify…)	Choosing one or multiple from this menu and free text field for 'specify…'	M

7	Length of hospital stay (LOS)	The number of days in hospital during the first admission (from day of surgery until discharge)	Number of days	O
8	Number of days in ICU	The number of days in Intensive Care Unit during the first admission (until discharge)	Number of days	O

15.2.4 Follow-up data

Nr.	Item	Definition	Units	Mandatory / Optional
1	Date of follow-up		DD/MM/YYYY	M
2	Donor lost to follow-up		Yes / No	M
3	Death		Yes / No	M
4	Cause of death	All coding systems are allowed		M
5	Date of death		DD/MM/YYYY	M
6	Weight		kg, no decimals	M
7	Antihypertensive treatment	Menu: > Nothing > Diet only > Medication: - Diuretics - Beta blockers - ACE blockers - A2 antagonists - Vasodilators/Calcium channel blockers - Other	Choosing one from this menu	M
8	Creatinine		Umol/L or mg/dl	M
9	Proteinuria	24 hour collection Spot urine in gram per litre Dipstick PCR (protein creatinine ratio)	g/24h g/L Y/N mg/mmol creat	M*
10	Health issues	Menu: > No > Yes, specify: - Abdominal surgery, specify… - Malignancies, specify... - Hematological disease, specify… - Neurological disease, specify… - Cardiovascular disease, specify… - Respiratory disease, specify… - Gastrointestinal disease, specify… - Psychiatric disease, specify… - Psychological disorder, specify… - Renal / urinary tract disease, specify… - Renal Replacement Therapy, specify… - Pregnancy, specify (when)…. - Diabetes mellitus, specify… - Other, specify… > Unknown	Choosing one or multiple from this menu and free text field for 'specify:...'	M
11	Did the donor return to previous activity level? (This item should only be collected during the 12 month follow-up visit.)	Menu: > Yes, within …. months > No > Unknown	Choosing one from this menu and free text field for ' … months'	O

* At least one of these options should be completed

15.3 National registry: LIVER

15.3.1 Donor demographic information

Nr.	Item	Definition	Units	Mandatory / Optional
1	Identification (ID number, initials)	The unique identification code that is given by the national authorities to each person, or a possibility to collect initials.		M
2	Date of birth		DD/MM/YYYY	O
3	Age	Actual age at the time of donation	years, no decimals	M
4	Gender		Male/Female	M
5	Weight		kg, no decimals	M
6	Height		cm, no decimals	M
7	Blood group	Menu: > A > B > 0 > AB	Choosing one from this menu	M
8	Address		Open field	O
9	Country of residence		ISO code 3166	M
10	Nationality		ISO code 3166	M
11	Ethnicity	Menu: > White > Asian > Black > Oriental > Mixed, please specify > Other, please specify	Choosing one from this menu and free text field for 'specify:...'	O

15.3.2 Pre-donation data

Nr.	Item	Definition	Units	Mandatory / Optional
1	Relation type	A living donor has one of the following three possible relationships with the recipient*: > A/ Related > A1/ Genetically related: a. 1st degree genetic relative: parent, sibling, offspring b. 2nd degree genetic relative: e.g. grandparent, grandchild, aunt, uncle, niece, nephew. c. Other than 1st or 2nd degree genetic related, for example cousin > A2/ Emotionally related: Spouse (if not genetically related); in-laws; adopted, friend. > B/ Unrelated: non-related = not genetically or emotionally related.	Choosing one from this menu	M

2	Any significant co-morbidity	Menu: > No > Yes, specify: - Abdominal surgery, specify… - Malignancies, specify... - Hematological disease, specify… - Neurological disease, specify… - Cardiovascular disease, specify… - Respiratory disease, specify… - Gastrointestinal disease, specify… - Psychiatric disease, specify… - Psychological disorder, specify… - Other, specify… > Unknown	Choosing one or multiple from this menu and free text field for 'specify:...'	M

* WHO, Global glossary of terms and definitions on Donation and Transplantation

15.3.3 Peri- and post-operative data (until discharge)

Nr.	Item	Definition	Units	Mandatory / Optional
1	Donor hospital (centre) name	List to be built by countries.		M
2	Country of donor hospital	The country in which the donation takes place	ISO code 3166	M
3	Date of donation		DD/MM/YYYY	M
4	Segment donated	> 2 > 3 > 2-3 > 2-3-4 > 5-6-7-8	Choosing one from this menu	M
5	Percentage of remnant donor liver	Menu: > <30% > 30-40% > 41-50% > 51-60% > >60%	Choosing one from this menu	M
6	Complications during operation	Menu: > No complications > Blood loss: need for transfusion > Liver graft damaged during retrieval - Liver can be used for transplantation - Liver is discarded for transplantation > Remaining liver damaged during surgery > Other organ damaged during surgery > Cardiac arrest > Other severe complications, specify...	Choosing one or multiple from this menu and free text field for 'specify...'	M

7	Complications after operation – until first discharge	Menu: > No complications > Blood loss: need for transfusion > Need for re-operation > Biliary fistula > Biliary stenosis > Infection (wound, other) > Non-infected collection > Thrombo/embolic complications (DVT, pulmonary embolism, arterial thrombosis, portal thrombosis) > Cardiac arrest > Liver insufficiency > Other severe complications (specify…)	Choosing one or multiple from this menu and free text field for 'specify…'	M
8	Length of hospital stay (LOS)	The number of days in hospital during the first admission (from day of surgery until discharge)	Number of days	O
9	Number of days in ICU	The number of days in Intensive Care Unit during the first admission (until discharge)	Number of days	O

15.3.4 Follow-up data

Nr.	Item	Definition	Units	Mandatory / Optional
1	Follow-up centre	List to be built by countries.		M
2	Date of follow-up		DD/MM/YYYY	M
3	Donor lost to follow-up		Yes / No	M
4	Death		Yes / No	M
5	Cause of death	All coding systems are allowed		M
6	Date of death		DD/MM/YYYY	M
7	Weight		kg, no decimals	M
8	Maximum bilirubin (within15 days after surgery)		Umol/L	M
9	Maximum INR (within15 days after surgery)		%	M
10	AST (at15 days after surgery)		U/L	M
11	ALT (at15 days after surgery)		U/L	M
12	GGT (at15 days after surgery)		U/L	M
13	Platelets (at15 days after surgery)		10*9/L	M
14	Complications (within the first 12 months)	Menu: > Nothing > Thrombo/embolic complications (DVT, pulmonary embolism, arterial thrombosis, portal thrombosis, lung embolism) > Infection (wound, surgical side infection, infected collection, other) > Non-infected collection > Biliary stricture > Biliary fistula > Liver insufficiency > Hemorrhage > Pleural effusion > Other complications, specify	Choosing one or multiple from this menu and free text field for 'specify:...'	M

15	Readmission (within the first 12 months)	Menu: > Yes, length of hospital stay > No > Unknown	Choosing one and length of admission in days	M
16	Health issues	Menu: > No > Yes, specify - Abdominal surgery, specify… - Malignancies, specify... - Hematological disease, specify… - Neurological disease, specify… - Cardiovascular disease, specify… - Respiratory disease, specify… - Gastrointestinal disease, specify… - Psychiatric disease, specify… - Psychological disorder, specify… - Pregnancy, specify (when)…. - Diabetes mellitus, specify… - Liver disease, specify… - Other, specify… > Unknown	Choosing one or multiple from this menu and free text field for 'specify:...'	M
17	Did the donor return to previous activity level? (This item should only be collected during the 12 month follow-up visit.)	Menu: > Yes, within …. months > No > Unknown	Choosing one from this menu and free text field for ' … months'	O

15.4 Registry of registries: LIVER

15.4.1 Donor demographic information

Nr.	Item	Definition	Units	Mandatory / Optional
1	Identification (ID number, initials)	The unique identification code that is given by the national authorities to each person, or a possibility to collect initials.		M
2	Date of birth		DD/MM/YYYY	O
3	Age	Actual age at the time of donation	years, no decimals	M
4	Gender		Male/Female	M
5	Weight		kg, no decimals	M
6	Height		cm, no decimals	M
7	Blood group	Menu: > A > B > 0 > AB	Choosing one from this menu	M
8	Country of residence		ISO code 3166	M
9	Nationality		ISO code 3166	M

10	Ethnicity	Menu: > White > Asian > Black > Oriental > Mixed, please specify > Other, please specify	Choosing one from this menu and free text field for 'specify:...'	O

15.4.2 Pre-donation data

Nr.	Item	Definition	Units	Mandatory / Optional
1	Relation type	Menu: > Related a. Genetically b. Non-genetically > Unrelated	Choosing one from this menu	M
2	Any significant co-morbidity	Menu: > No > Yes, specify: - Abdominal surgery, specify… - Malignancies, specify... - Hematological disease, specify… - Neurological disease, specify… - Cardiovascular disease, specify… - Respiratory disease, specify… - Gastrointestinal disease, specify… - Psychiatric disease, specify… - Psychological disorder, specify… - Other, specify… > Unknown	Choosing one or multiple from this menu and free text field for 'specify:...'	M

15.4.3 Peri- and post-operative data (until discharge)

Nr.	Item	Definition	Units	Mandatory / Optional
1	Country of donor hospital	The country in which the donation takes place	ISO code 3166	M
2	Date of donation		DD/MM/YYYY	M
3	Segment donated	> 2 > 3 > 2-3 > 2-3-4 > 5-6-7-8	Choosing one from this menu	M
4	Percentage of remnant donor liver	Menu: > <30% > 30-40% > 41-50% > 51-60% > >60%	Choosing one from this menu	M

5	Complications during operation	Menu: > No complications > Blood loss: need for transfusion > Liver graft damaged during retrieval a. Liver can be used for transplantation b. Liver is discarded for transplantation > Remaining liver damaged during surgery > Other organ damaged during surgery > Cardiac arrest > Other severe complications, specify...	Choosing one or multiple from this menu and free text field for 'specify...'	M
6	Complications after operation – until first discharge	Menu: > No complications > Blood loss: need for transfusion > Need for re-operation > Biliary fistula > Biliary stenosis > Infection (wound, other) > Non-infected collection > Thrombo/embolic complications (DVT, pulmonary embolism, arterial thrombosis, portal thrombosis) > Cardiac arrest > Liver insufficiency > Other severe complications (specify…)	Choosing one or multiple from this menu and free text field for 'specify…'	M
7	Length of hospital stay (LOS)	The number of days in hospital during the first admission (from day of surgery until discharge)	Number of days	O
8	Number of days in ICU	The number of days in Intensive Care Unit during the first admission (until discharge)	Number of days	O

15.4.4 Follow-up data

Nr.	Item	Definition	Units	Mandatory / Optional
1	Date of follow-up		DD/MM/YYYY	M
2	Donor lost to follow-up		Yes / No	M
3	Death		Yes / No	M
4	Cause of death	All coding systems are allowed		M
5	Date of death		DD/MM/YYYY	M
6	Weight		kg, no decimals	M
7	Maximum bilirubin (within 15 days after surgery)		Umol/L	M
8	Maximum INR (within 15 days after surgery)		%	M
9	AST (at15 days after surgery)		U/L	M
10	ALT (at15 days after surgery)		U/L	M
11	GGT (at15 days after surgery)		U/L	M
12	Platelets (at15 days after surgery)		10*9/L	M

13	Complications (within the first 12 months)	Menu: > Nothing > Thrombo/embolic complications (DVT, pulmonary embolism, arterial thrombosis, portal thrombosis, lung embolism) > Infection (wound, surgical side infection, infected collection, other) > Non-infected collection > Biliary stricture > Biliary fistula > Liver insufficiency > Hemorrhage > Pleural effusion > Other complications, specify	Choosing one or multiple from this menu and free text field for 'specify:...'	M
14	Readmission (within the first 12 months)	Menu: > Yes, length of hospital stay > No > Unknown	Choosing one and length of admis-sion in days	M
15	Health issues	Menu: > No > Yes, specify - Abdominal surgery, specify… - Malignancies, specify... - Hematological disease, specify… - Neurological disease, specify… - Cardiovascular disease, specify… - Respiratory disease, specify… - Gastrointestinal disease, specify… - Psychiatric disease, specify… - Psychological disorder, specify… - Pregnancy, specify (when)…. - Diabetes mellitus, specify… - Liver disease, specify… - Other, specify… > Unknown	Choosing one or multiple from this menu and free text field for 'specify:...'	M
16	Did the donor return to previous activity level? (This item should only be collected during the 12 month follow-up visit.)	Menu: > Yes, within …. months > No > Unknown	Choosing one from this menu and free text field for ' … months'	O

15.5 Glossary of terms

Not every item needs specification in this Glossary of terms. Some items however need an extra explanation about the way the item should be measured or collected. Another important issue is the way the registration in a national database will be translated into the supranational Registry of registries.

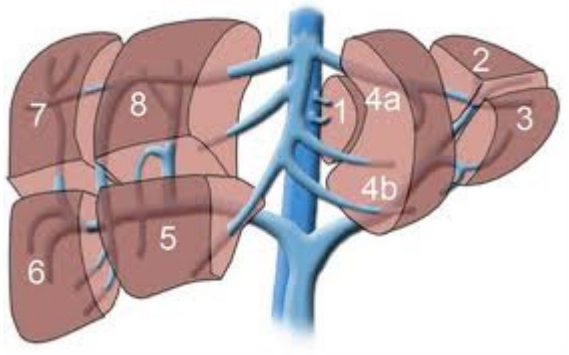
Item	Definition
Antihypertensive treatment	> Nothing: this means a donor does not use any diet and/or drugs > Diet only: diet is not specified. Anything a person calls a diet and is appropriate to control the person's blood pressure is considered a diet. Medication: The following classes of antihypertensive drugs can be identified: - Diuretics - Beta blockers - ACE blockers - A2 antagonists - Vasodilators/Calcium channel blockers - Other It is assumed that every donor with a class of antihypertensive drugs has had diet advice before the treatment with medication started.
Any significant co-morbidity (KIDNEY)	Menu: > No > Yes, specify: - Abdominal surgery, specify… - Malignancies, specify... - Hematological disease, specify… - Neurological disease, specify… - Cardiovascular disease, specify… - Respiratory disease, specify… - Gastrointestinal disease, specify… - Psychiatric disease, specify… - Psychological disorder, specify… - Renal / urinary tract disease, specify… - Other, specify… > Unknown
Any significant co-morbidity (LIVER)	Menu: > No > Yes, specify: - Abdominal surgery, specify… - Malignancies, specify... - Hematological disease, specify… - Neurological disease, specify… - Cardiovascular disease, specify… - Respiratory disease, specify… - Gastrointestinal disease, specify… - Psychiatric disease, specify… - Psychological disorder, specify… - Other, specify… > Unknown
Blood pressure	Actual blood pressure (independent of the method of measurement): the method to collect the actual blood pressure is not defined.
Cause of death	All coding systems are allowed

Complications during operation (KIDNEY)	Complications during operation means from the start of the surgery until arrival at the recovery room. Menu: > No complications > Blood loss: need for transfusion > Kidney damaged during retrieval: this means that the kidney that is procured from the donor (graft) is damaged a. Kidney can be used for transplantation b. Kidney is discarded for transplantation > Other organ damaged during surgery: this means another organ (not the procured organ) is (physically) damaged during the operation. > Switch from laparoscopic procedure to open technique > Cardiac arrest > Other severe complications (i.e. pneumothorax, anaphylactic reaction), specify...: this will be a free text field.
Complications during operation (LIVER)	Menu: > No complications > Blood loss: need for transfusion > Liver graft damaged during retrieval: this means that the liver graft that is procured from the donor is damaged a. Liver can be used for transplantation b. Liver is discarded for transplantation > Remaining liver damaged during surgery > Other organ damaged during surgery > Cardiac arrest > Other severe complications, specify...
Complications after operation – until first discharge (KIDNEY)	Complications after operation means from the departure from the recovery room until discharge from the hospital. Menu: > No complications > Blood loss: need for transfusion > Need for re-operation, specify… > Infection (urinary, wound, other): therapeutic use of antibiotics > Thrombo/embolic complications (DVT, pulmonary embolism) > Renal Replacement Therapy, specify… > Cardiac arrest > Other severe complications (specify…): this will be a free text field.
Complications after operation – until first discharge (LIVER)	Menu: > No complications > Blood loss: need for transfusion > Need for re-operation, specify… > Biliary fistula: when bilirubin concentration in drained fluids is 3 or more times higher then in serum > Biliary stenosis > Infection (wound, other) > Non-infected collection > Thrombo/embolic complications (DVT, pulmonary embolism, arterial thrombosis, portal thrombosis) > Cardiac arrest > Liver insufficiency > Other severe complications (specify…)

Complications (within the first 12 months)	Menu: > Nothing > Thrombo/embolic complications (DVT, pulmonary embolism, arterial thrombosis, portal thrombosis, lung embolism) > Infection (wound, surgical side infection, infected collection, other) > Non-infected collection > Biliary stricture > Biliary fistula > Liver insufficiency > Hemorrhage > Pleural effusion > Other complications, specify
Country of residence	This is the country where the person lives during 7 months of a year.
Did the donor return to previous activity level?	This item should only be collected during the 12 month follow-up visit. This should be based on the person's answer and should not be an objective measurement. Menu: > Yes, within …. months > No > Unknown
Donor lost to follow-up	A donor is lost to follow-up if he/she has regularly been invited to follow-up appointments, but did not show up during 10 years. Because the mandatory follow-up frequency is at discharge, 1 year after donation and then every 5 years, this means the donor did not show up during at least three visits.
Ethnicity	Menu: > White > Asian > Black > Oriental > Mixed, please specify > Other, please specify
Health issues (KIDNEY)	Menu: > No > Yes, specify - Abdominal surgery, specify… - Malignancies, specify... - Hematological disease, specify… - Neurological disease, specify… - Cardiovascular disease, specify… - Respiratory disease, specify… - Gastrointestinal disease, specify… - Psychiatric disease, specify… - Psychological disorder, specify - Renal / urinary tract disease, specify - Renal Replacement Therapy - Pregnancy, specify (when)… - Diabetes mellitus, specify… - Other, specify…

Health issues (LIVER)	Menu: > No > Yes, specify - Abdominal surgery, specify… - Malignancies, specify... - Hematological disease, specify… - Neurological disease, specify… - Cardiovascular disease, specify… - Respiratory disease, specify… - Gastrointestinal disease, specify… - Psychiatric disease, specify… - Psychological disorder, specify - Pregnancy, specify (when)…. - Diabetes mellitus, specify… - Liver disease, specify… - Other, specify… > Unknown
Hypertension	Hypertension: Yes / No Hypertension should be considered 'yes' when a person uses a diet or medication to treat the hypertension. If a person does not use a diet or medication, but has a blood pressure >140/90 mmHg, the person is also considered hypertensive.
Identification	The national authorities in (almost) every MS give a unique identification code to each individual. This code could be used to identify a person without collecting their name. If a country decides not to use the unique identification code, another method should be used to prevent collecting data about the same person twice. For example a combination of initials and date of birth.
Length of hospital stay (LOS)	The number of days in hospital during the first admission from day 0 to the day of discharge, with day 0 being the day of surgery.
Nationality	In case of a double nationality, register both.
Number of days in ICU	The number of days in Intensive Care Unit during the first admission (until discharge)
Percentage of remnant donor liver	Menu: > <30% > 30-40% > 41-50% > 51-60% > >60%
Readmission (within the first 12 months)	Menu: > Yes, length of hospital stay (in days) > No > Unknown
Relation type	The definition that is applicable for the national kidney database differs from the definition of the Registry of registries. To be able to collect the information, the national and supranational registries should be able to communicate with each other. The possibilities from the national database should correspond with the simplified definition:

National:	Supranational:
> A/ Related	> Related
> A1/ Genetically related:	> Genetically related
a. 1st degree genetic relative: parent, sibling, offspring	> Genetically related
b. 2nd degree genetic relative: e.g. grandparent, grandchild, aunt, uncle, niece, nephew,	> Genetically related
c. Other than 1st or 2nd degree genetically related, for example cousin	> Genetically related
> A2/ Emotionally related: Spouse (if not genetically related); in-laws; adopted, friend	> Non-genetically related
> B/ Unrelated: non-related = not genetically or emotionally related.	> Non-related: this means donor and recipient do not know each other

Segment donated	The liver could be divided into 8 different segments.  The part of the liver (segment) that is procured from the donor should be specified: > 2 > 3 > 2-3 > 2-3-4 > 5-6-7-8

16. References

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> (3) Yilmaz S, Kayaalp C, Ara C, Yilmaz M, Isik B, Aydin C, Ozgor D, Dirican A, Barut B, Unal B, Piskin T, Ates M, Kutlu R, Toprak HI, Bayindir Y, Kirimlioglu H, Aladag M, Harputluoglu M, Selimoglu A, Karabiber H, Yalcin K, Kirimlioglu V. Single-centre analysis of the first 304 living-donor liver transplantations in 3 years. Hepatogastroenterology. 2013 Jul-Aug;60(125):1105-9.

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> (12) Transplant trends at: http://www.transplantliving.org/?module=data&trend=transplants-donor-type&organ=Lung

> (13) Muzaale AD, Massie AB, Wang MC, Montgomery RA, McBride MA, Wainright JL, Segev DL: Risk of End Stage Renal Disease Following Live Kidney Donation. JAMA; 2014; 311(6):579-589.

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> (15) Living donation. ´Information you need to know´, http://www.unos.org/docs/Living_Donation.pdf

> (16) EFRETOS stands for European Framework for the Evaluation of Organ Transplants. This European project to promote a follow-up Registry of Registries was finished in 2011. www.efretos.org

> (17) EULID stands for Euro Living Donor. This EU co-funded project to guarantee the living donors health and safety was finished in 2012. www.eulivingdonor.eu.

ANNEX I: Questionnaire 'Current experience with living donation'

A. General information

Participating partner (country)
or
Collaborating partner

Name of representative
(person who filled in this questionnaire + email address)

B. Current experience with living donation and living donor follow-up

> 1 Does your country have experience with living donation?
☐ YES, kidney only
☐ YES, both kidney and liver
☐ NO

> 2 Does your country systematically gather information on living donor follow-up?
☐ YES, kidney only
☐ YES, both kidney and liver
☐ NO

> 3 Is this information collected in a digital registry?
☐ YES à if yes, please skip question 4.
☐ NO à if no, please answer question 4.

> 4 If your country does not yet collect data in a digital registry, does your country want to have such a registry?
☐ YES à if yes, please fill out the questions in this questionnaire with a preferred situation in mind
☐ NO

> 5 Please specify if this is gathered in a national or local registry
☐ Local
☐ National

> 6 Is the information from your local registry shared in a national registry?
☐ YES
☐ NO

> 7 What was the starting date of data-collection in the registry?

C. Technical specification of the database

> 8 What kind of database does your country have?
☐ Excel
☐ Access
☐ Oracle
☐ DB2 (IBM)
☐ SQL Server (Microsoft)
☐ Other, please specify……

> 9 How is this database hosted and by whom? (name + email address)

> 10 Who is responsible for data collection in the hospitals / transplant centres?

D. Detailed specification on the content of the database

> 11 Please specify if the following items are collected in your registry, what definitions are used and if these items are mandatory:

Data for evaluation of the donor

Item	Definition	Mandatory Y/N
Age		
Gender		
Relation type		
Weight		
Length		
Creatinine		
Blood pressure		
Anti hypertensive drugs		

Data concerning the transplantation

Item	Definition	Mandatory Y/N
Operation technique		
Left of right kidney		
Complications during operation		
Blood group		
HLA-type		
EBV		
CMV		
Hepatitis B, C		

Data for follow-up of the donor

Item	Definition	Mandatory Y/N
Weight		
Height		
Creatinine		
Proteinuria		
Blood pressure		
Anti hypertensive drugs		
Complications after operation		

> 12 What other items does your country collect in a database, what definitions are used and are these items mandatory:

Item	Definition	Mandatory Y/N

> 13 What other variables, –that are currently not collected in your own database- would you prefer to collect in a(n international) registry of registries?

Item	Definition	Mandatory Y/N

E Practical information about using the database

> 14 How many hospitals / transplant centres share their data in your registry?

> 15 How many donors are yet included in your registry?

> 16 What is the follow-up frequency for each donor?

> 17 Please specify the procedure to obtain consent from the donors:

> 18 Could you estimate the completeness (%) of your registry and describe how your completeness is calculated.

> 19 Who determines if the request for data from your registry is granted?

> 20 Is there a specific person responsible for answering (helpdesk) questions about the database, performing statistical analysis, etc? (name + email address)

ANNEX II: Results of questionnaire

Additional items that are already collected by MS, or items that MS would like to collect

Data for evaluation of the donor

Item	Times mentioned	Mandatory Y	Mandatory N
Address of donor	2	2	
Albuminuria in spot urine	1		1
Bilirubin for living donors	1	1	
Cholesterol	1	1	
Creatinine levels	1		1
Cross match	1	1	
Date of review	1	1	
Donor lost to follow-up	1		1
Endogenous Creatinine Clearance / Glomerular Filtration Rate / Cockroft-Gault	5	2	3
Ethical committee	1	1	
Fasting blood glucose	2	1	1
GOT (AST) for living donors	1	1	
GPT (ALT) for living donors	1	1	
HDL	1	1	
HIV	1	1	
ID number	3	3	
Microalbuminuria	2	1	1
Name	2	2	
Nationality	3	1	2
Organ: liver / kidney	1	1	
Other diseases (specify)	1		1
Place of birth	1		1
Race	1		1
Residence country	2	2	
Smoking	2	1	
Treatment	1		1
Triglycerides	1	1	

Data concerning the donation procedure

Item	Times mentioned	Mandatory Y	Mandatory N
Blood pressure at discharge	1		1
Cause of reintervention	1		1
Cold ischemic time	1	1	
Creatinine levels at discharge	1		1
Date of hospital discharge	3	3	
Date of nephrectomy/donation/surgery/ explantation operation	5	4	1
Date of review	1	1	
Endogenous Creatinine Clearance / Glomerular Filtration Rate / Cockroft-Gault	5	2	3
Hemoglobin	1		1
Hospital (name) / donation centre	3	3	
Microscopic haematuria	1		1
Number of arteria	1		1
Number of veins	1		1
Proteinuria at evaluation	3	2	1
Reintervention	1	1	
Reintervention date	1		1
Urine changes at discharge	1		1
Urine test at discharge	1		1
Warm ischemic time	1	1	

Data for follow-up of the donor

Item	Times mentioned	Mandatory Y	Mandatory N
Albuminuria in spot urine	1		1
Bilirubin for living donors	1	1	
Cause of death / death related to donation	5	1	4
Cause of readmission	1		1
Cholesterol	1	1	
Creatinine levels	1		1
Date of attendance for follow-up	1		1
Date of death	3	1	2
Date of readmission	1		1
Date of review	1	1	
Death	4	2	2
Diabetes	3	1	2
Donor diagnosis after donation	1	1	
Donor lost to follow-up	1		1
Employment status	1		1
Endogenous Creatinine Clearance / Glomerular Filtration Rate / Cockroft-Gault	5	2	3
Fasting blood glucose	2	1	1
Follow up status (i.e. lost, transferred)	1		1
Follow-up centre	1	1	
Glucose curve	1		1
Glycosylated Hb	1		
GOT (AST) for living donors	1	1	

GPT (ALT) for living donors	1	1	
Hemoglobin	1		1
HDL	1	1	
Hospital readmission	2	1	1
Major health issues since last review	1		1
Malignancy	1		1
Microalbuminuria	2	1	1
Microscopic haematuria	1		1
New disease description	1		1
Other diseases (specify)	1		1
Smoking	2	1	1
Time until to normal activity	1		1
Treatment description	1		1
Triglycerides	1	1	
Urological or nephrological disease	2	1	1

ANNEX III: DATA SET AND DATA DICTIONARY IN PILOT

Registry of registries: KIDNEY

Donor demographic information

Nr.	Item	Definition	Units	Mandatory / Optional
1	Identification (ID number, initials)	The unique identification code that is given by the national authorities to each person, or a possibility to collect initials.		M
2	Date of birth		DD/MM/YYYY	O
3	Age	Actual age at the time of donation	years, no decimals	M
4	Gender		Male/Female	M
5	Weight		kg, no decimals	M
6	Height		cm, no decimals	M
7	Blood group	Menu: > A > B > 0 > AB	Choosing one from this menu	M
8	Country of residence		ISO code 3166	M
9	Nationality		ISO code 3166	M
10	Ethnicity	Menu: > White > Asian > Black > Oriental > Mixed, please specify > Other, please specify	Choosing one or multiple from this menu and free text field for 'specify:...'	O

Pre-donation data

Nr.	Item	Definition	Units	Mandatory / Optional
1	Relation type	Menu: > Related a. Genetically b. Non-genetically > Unrelated	Choosing one from this menu	M
2	Antihypertensive treatment	Menu: > Nothing > Diet only > Medication: - Diuretics - Beta blockers - ACE blockers - A2 antagonists - Vasodilators/Calcium channel blockers - Other	Choosing one from this menu	M
3	Creatinine		Umol/L or mg/dl	M
4	Proteinuria	PCR (protein creatinine ratio)	mg/mmol creat	M

5	Any significant co-morbidity	Menu: > No > Yes, specify: - Abdominal surgery, specify… - Malignancies, specify... - Hematological disease, specify… - Neurological disease, specify… - Cardiovasculair disease, specify… - Respiratory disease, specify… - Gastrointestinal disease, specify… - Psychiatric disease, specify… - Psychological disorder, specify… - Renal / urinary tract disease, specify… - Other, specify… > Unknown	Choosing one or multiple from this menu and free text field for 'specify:...'	M

Peri- and post-operative data (until discharge)

Nr.	Item	Definition	Units	Mandatory / Optional
1	Country of donor hospital	The country in which the donation takes place	ISO code 3166	M
2	Date of donation		DD/MM/YYYY	M
3	Left or right kidney		Left / Right	M
4	Operation technique	Menu: > Open technique a. Classic technique - Costal resection - No costal resection b. Mini-incision > Laparoscopic a. Standard b. Hand assisted laparoscopic > Other, specify…	Choosing one from this menu	M
5	Complications during operation	Menu: > No complications > Blood loss: need for transfusion > Kidney damaged during retrieval a. Kidney can be used for transplantation b. Kidney is discarded for transplantation > Other organ damaged during surgery > Switch from laparoscopic procedure to open technique > Cardiac arrest > Other severe complications (i.e. pneumothorax, anaphylactic reaction) (specify…)	Choosing one or multiple from this menu and free text field for 'specify...'	M
6	Complications after operation – until first discharge	Menu: > No complications > Blood loss: need for transfusion > Need for re-operation > Infection (urinary, wound, other) > Thrombo/embolic complications (DVT, pulmonary embolism) > Renal Replacement Therapy, specify… > Cardiac arrest > Other severe complications (specify…)	Choosing one or multiple from this menu and free text field for 'specify…'	M
7	Length of hospital stay (LOS)	The number of days in hospital during the first admission (until discharge)	Number of days	O
8	Number of days in ICU	The number of days in Intensive Care Unit during the first admission (until discharge)	Number of days	O

Follow-up data

Nr.	Item	Definition	Units	Mandatory / Optional
1	Date of follow-up		DD/MM/YYYY	M
2	Donor lost to follow-up		Yes / No	M
3	Death		Yes / No	M
4	Cause of death	All coding systems are allowed		M
5	Date of death		DD/MM/YYYY	M
6	Weight		kg, no decimals	M
7	Antihypertensive treatment	Menu: > Nothing > Diet only > Medication: - Diuretics - Beta blockers - ACE blockers - A2 antagonists - Vasodilators/Calcium channel blockers - Other	Choosing one from this menu	M
8	Creatinine		Umol/L or mg/dl	M
9	Proteinuria	PCR (protein creatinine ratio)	mg/mmol creat	M
10	Health issues	Menu: > No > Yes, specify: - Abdominal surgery, specify… - Malignancies, specify... - Hematological disease, specify… - Neurological disease, specify… - Cardiovascular disease, specify… - Respiratory disease, specify… - Gastrointestinal disease, specify… - Psychiatric disease, specify… - Psychological disorder, specify… - Renal / urinary tract disease, specify… - Renal Replacement Therapy, specify… - Pregnancy, specify (when)…. - Diabetes mellitus, specify… - Other, specify… > Unknown	Choosing one or multiple from this menu and free text field for 'specify:...'	M
11	Did the donor return to previous activity level? (This item should only be collected during the 12 month follow-up visit.)	Menu: > Yes, within …. months > No > Unknown	Choosing one from this menu and free text field for ' … months'	O

ANNEX IV: EVALUATED PARAMETERS

Practical evaluation

- Evaluation of the user-friendliness (direct data entry and file upload)
  - Logging into the application
  - Manuals and instructions
  - Look and feel of the registry
  - Using the application
- Finding and extracting the necessary data from donor's files (% completeness of data)
- Obtaining permission to use the donor's collected (anonymized) follow-up information for (international) data sharing in a registry of registries;
- Obtaining permission to use the donor's collected (anonymized) follow-up information for (international) research / analysis;
- Extracting data from existing registries;
- Experiences with data conversion from existing registries into ACCORD pilot registry (time, technique, number of missing values);
- Keeping the ACCORD WP4 pilot registry in mind: evaluation of the described governing, operational and technical rules for living donor registries;
- Evaluation of the co-operation / interaction between project leader, participating project partners (in the pilot), and collaborating partner (Hospital Clinic of Barcelona);
- Suggestions from participating partners for a future sustainable registry.

Technical evaluation

- Evaluation of the choice to build a web-based platform;
- Evaluation of the direct data entry possibility;
- Evaluation of the technical challenge in data conversion (programmed possibilities versus manual conversion);
- Evaluation of the file-upload module;
- Evaluation of the extraction module (export data);
- Evaluation of the difference in using the registry as a national registry or a supranational registry of registries;
- Evaluation of data security.

Data evaluation

- For the evaluation of the pilot the following items and statistical analyses are included:
- The number of donors included in the pilot in total and divided by country;
- The number of donors included in the pilot by file upload and per direct entry;

The following data is evaluated on a global level, not on a national level:

- Before donation (mean, mediate and modus):
  - age
  - weight
  - length
  - BMI
  - creatinine
  - proteinuria
- Distribution of gender, blood group, ethnicity, relation between donor and recipient, left/right kidney donated;

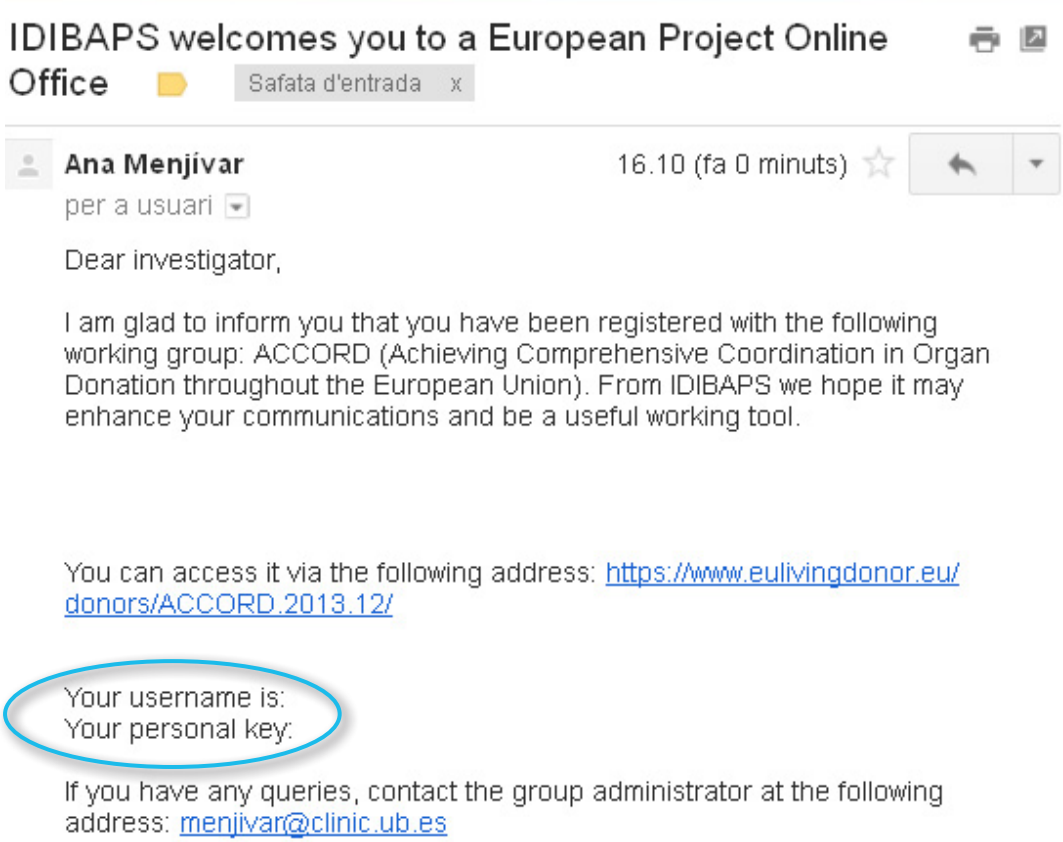
- The presence of antihypertensive medication (also type and total count), co-morbidity;
- During and after operation:
  - Distribution of operation technique;
  - Occurrence of complications during operation and in the first weeks after donation;
  - Any health issues in the first year after donation;
  - Death;
  - The use of antihypertensive drugs;
  - The average creatinine and proteinuria at 1 year, length of stay in the hospital and in the ICU, return to previous activity.
- Number of missing items;
- Statistical analysis
  - Descriptive analysis of the abovementioned items;
  - Changes in creatinine, proteinuria, use of antihypertensive drugs before donation and at 1 year after donation;
  - Health issues during the first year after donation in relation to age, gender, BMI, left/right kidney;
  - Length of stay in the hospital and ICU in relation to age, gender, BMI, left/right kidney;
  - Change in creatinine, proteinuria, and the use of antihypertensive drugs (before donation and at 1 year after donation) in relation to age, gender, BMI, left/right kidney;
  - Occurrence of death in relation to age, gender, BMI, left/right kidney;
  - Operational technique in relation to complications, health issues during the first year and length of hospital stay.
  - Complications during operation and in the first weeks after donation in relation to age, gender, BMI, left/right kidney;
  - Length of time to return to previous activity in relation to age, gender, BMI, left/right kidney.

ANNEX V: GUIDELINE DIRECT DATA ENTRY

HOW TO USE "DIRECT DATA ENTRY" MODEL FOR ACCORD PILOT REGISTRY

1 All the participants of Each member State will receive an email with the following subject: "**IDIBAPS welcomes you to a European Project Online Office**" containing access data: username and password.

NOTE: For the security of the ACCORD pilot registry **t**he username and password are personal and no transferable.



IDIBAPS welcomes you to a European Project Online Office

Safata d'entrada x

Ana Menjivar 16.10 (fa 0 minuts)

per a usuari

Dear investigator,

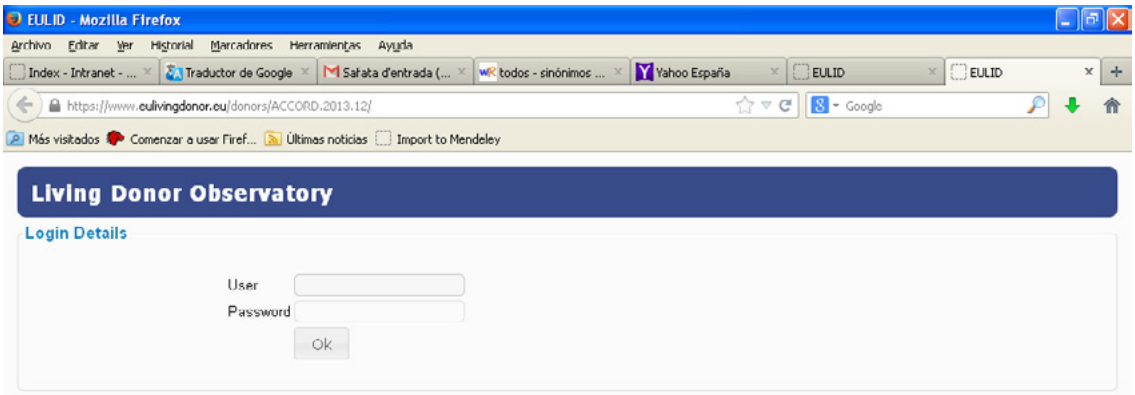
I am glad to inform you that you have been registered with the following working group: ACCORD (Achieving Comprehensive Coordination in Organ Donation throughout the European Union). From IDIBAPS we hope it may enhance your communications and be a useful working tool.

You can access it via the following address: https://www.eulivingdonor.eu/donors/ACCORD.2013.12/

Your username is:
Your personal key:

If you have any queries, contact the group administrator at the following address: menjivar@clinic.ub.es

2 Click the following link: https://www.eulivingdonor.eu/donors/ACCORD.2013.12/ and introduce your personal accessing data.



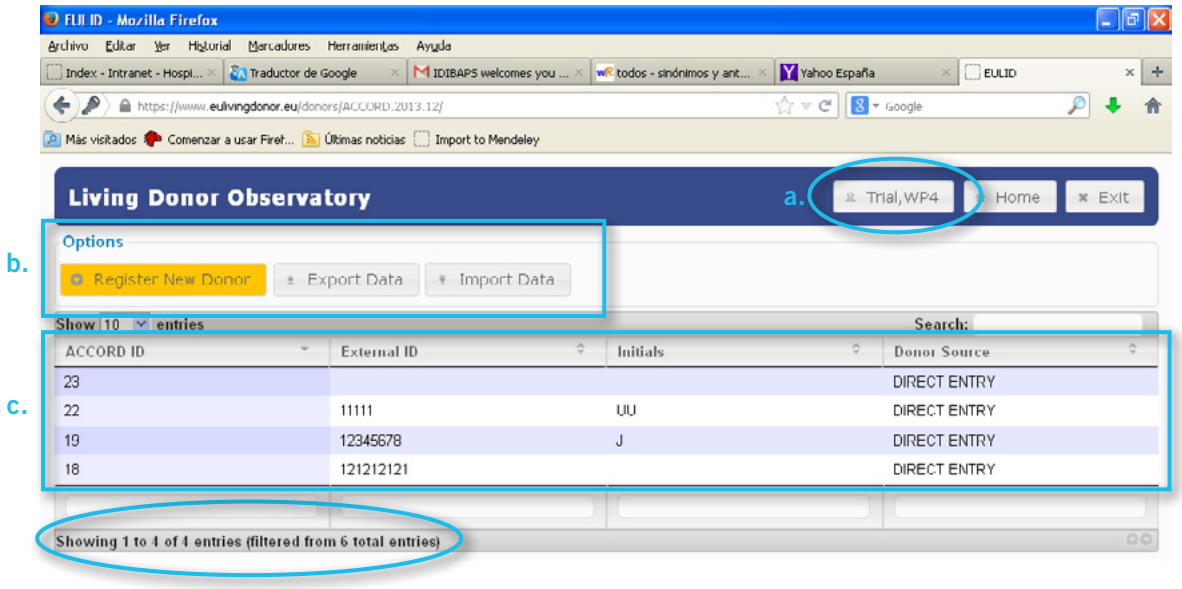
3 The main page will be opened.

There you will find:

a. Personal information

b. Different actions available in the registry – using the **national visibility profile**.

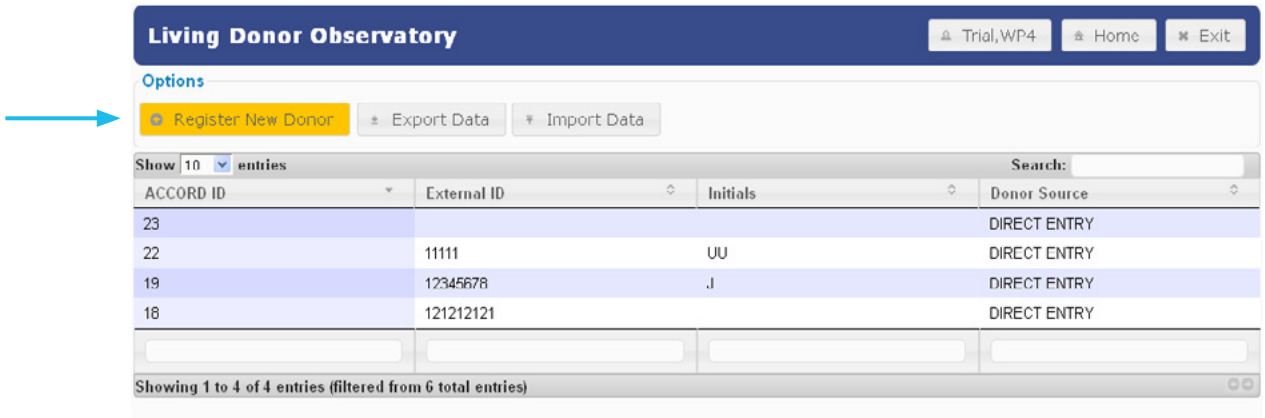
c. Summary of your current registered donors – due to the **national visibility** you can see only the registered donors of your country regardless of the person who introduced the donor.



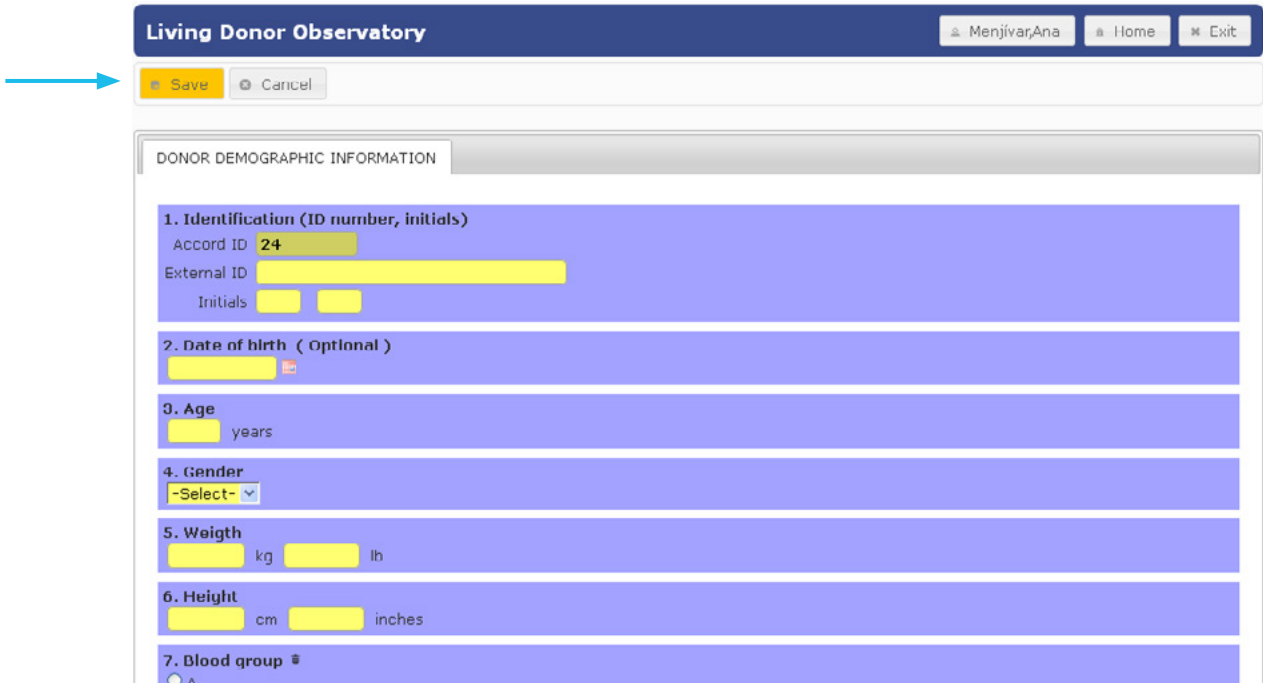
Note: The total number of entries includes all the donors registered in the pilot registry and the system automatically filters the donor of your country.

1 How to register a new donor?

In the main page click the bottom **"Register a new donor"** (yellow color)



Subsequently a new window contains the Donor Demographic Information will be opened. After you will complete the required, please click **"Save"** and the system automatically will save these data and you will be redirected in the main page.



The ACCORD ID is correlative and given automatically by the system when a new donor is registered.

After the data are saved, the ID of the new donor will appear in the main page. Please click in the number ID and a new menu with different actions for this donor will be displayed.

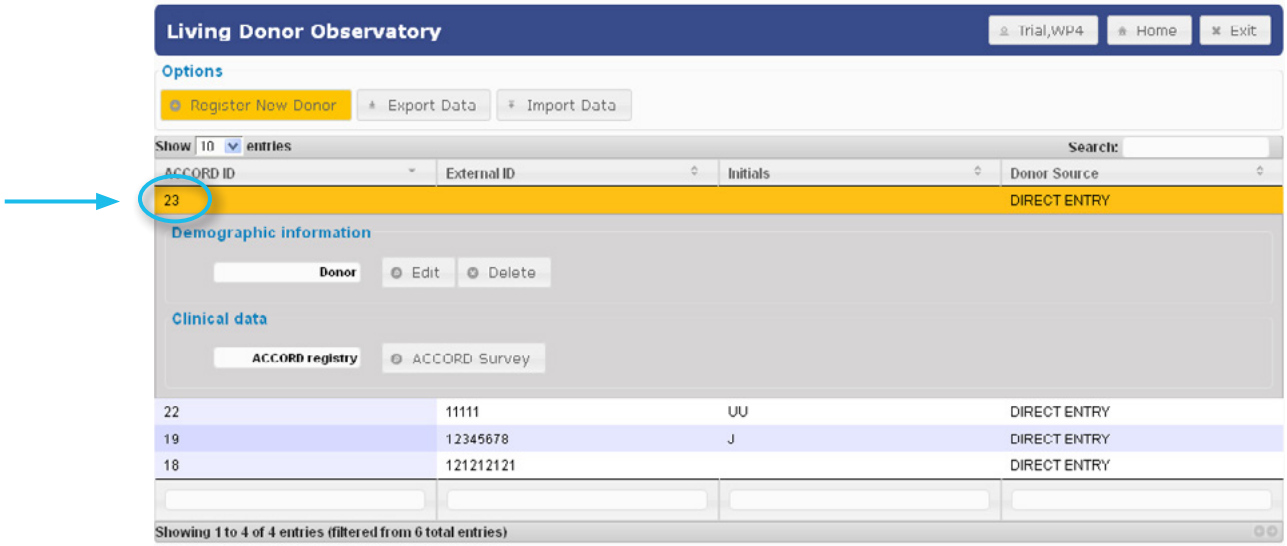
> Demographic information:
  Edit: To modify the demographic information previously introduced.

  Delete: To delete this ID and the specific information previously introduced.

  In order you will need to delete the data the system will require you to confirm the action and afterwards to write down the reason of the action.

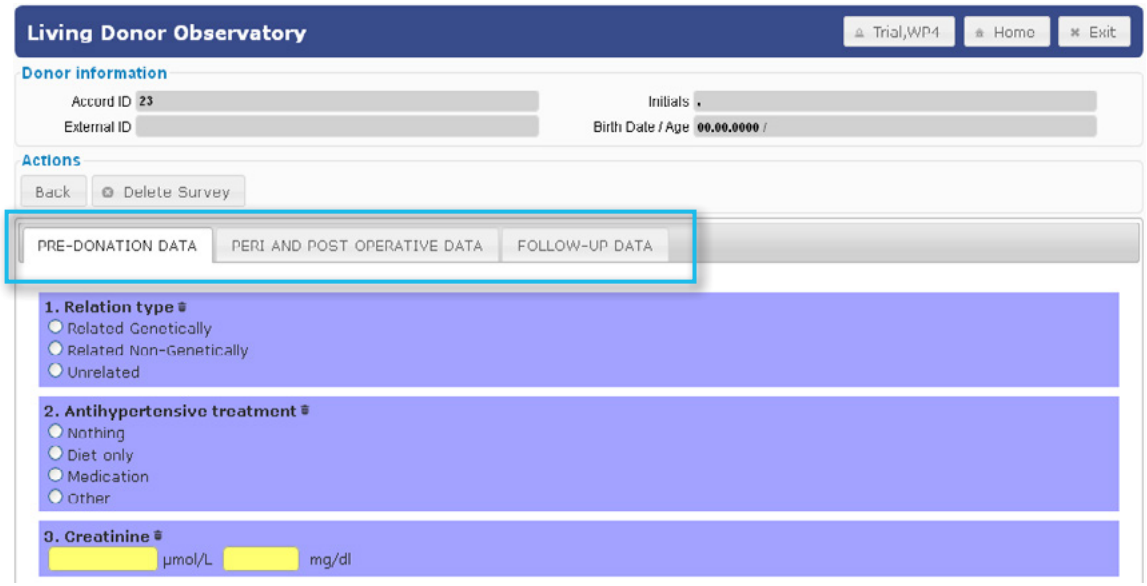
  This information will go directly to the administrator.

> **Clinical data:** There is only the option to introduce the data collected for ACCORD survey.



Afterwards you could introduce the clinical data, separated in three different labels:

> Predonation data
> Peri and Postoperative data
> Follow-up data



The information you will be introducing is automatically saved, when you change the label. After finishing with the data entry, please click BACK and the information is already stored into the registry and you could start the process for a new donor.

Additional information:

We include in the pilot registry a specific function for automatic conversion of units and warnings messages for extremes values.

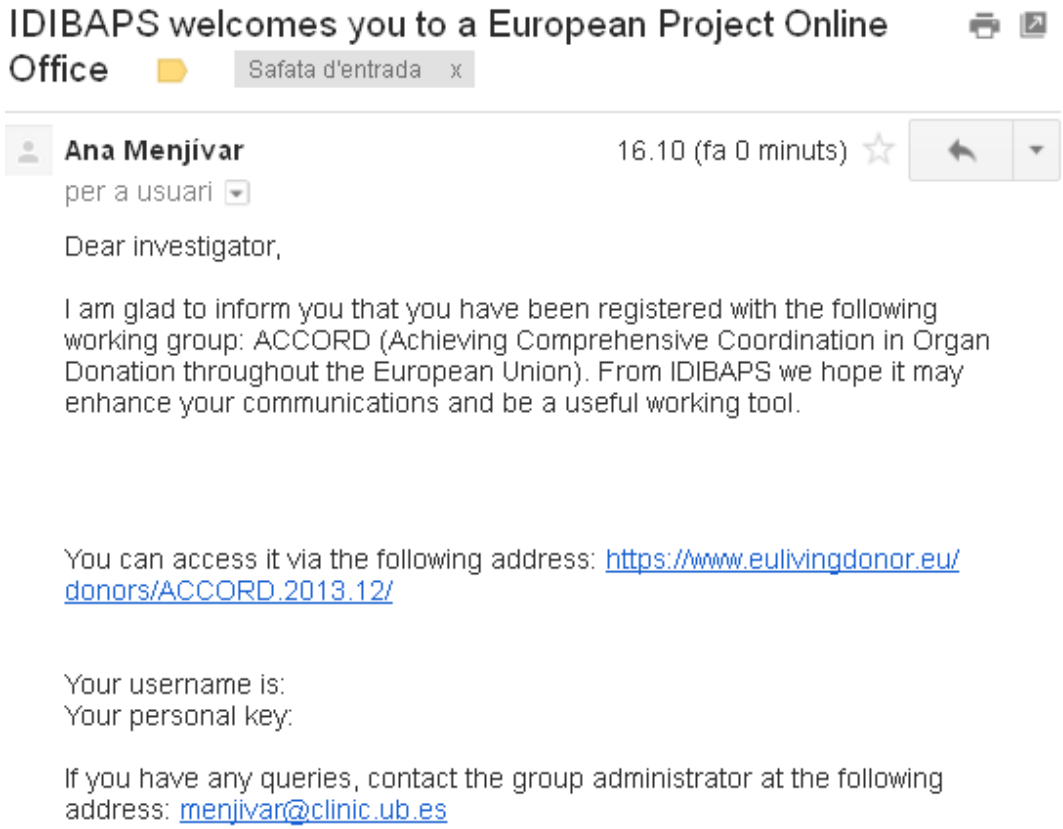
Please keep in mind that while the page is inactive for more than 15 minutes the system for safety reason logs out from the session. You will need to sign in again.

ANNEX VI: GUIDELINE FILE UPLOAD

HOW TO USE "FILE UPLOADING" MODEL FOR ACCORD PILOT REGISTRY

1 All ACCORD WP4 participants of each member State will receive an email with the following subject: "**IDIBAPS welcomes you to a European Project Online Office**" containing access data: username and password.

NOTE: For the security of the ACCORD pilot registry **t**he username and password are personal and not transferable.



IDIBAPS welcomes you to a European Project Online Office

Safata d'entrada x

Ana Menjívar 16.10 (fa 0 minuts)

per a usuari

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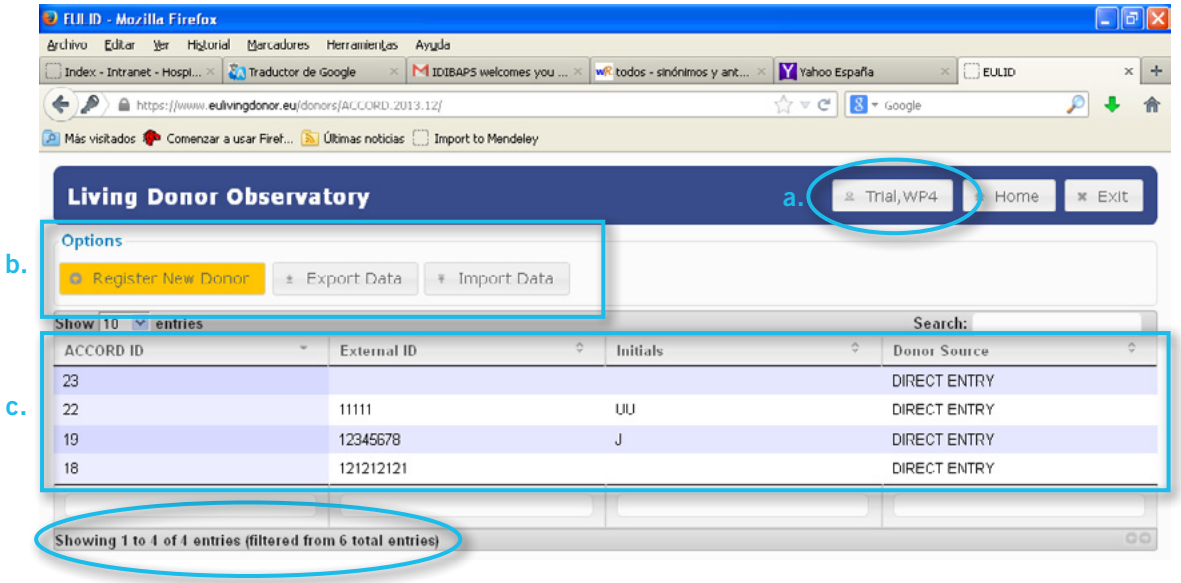
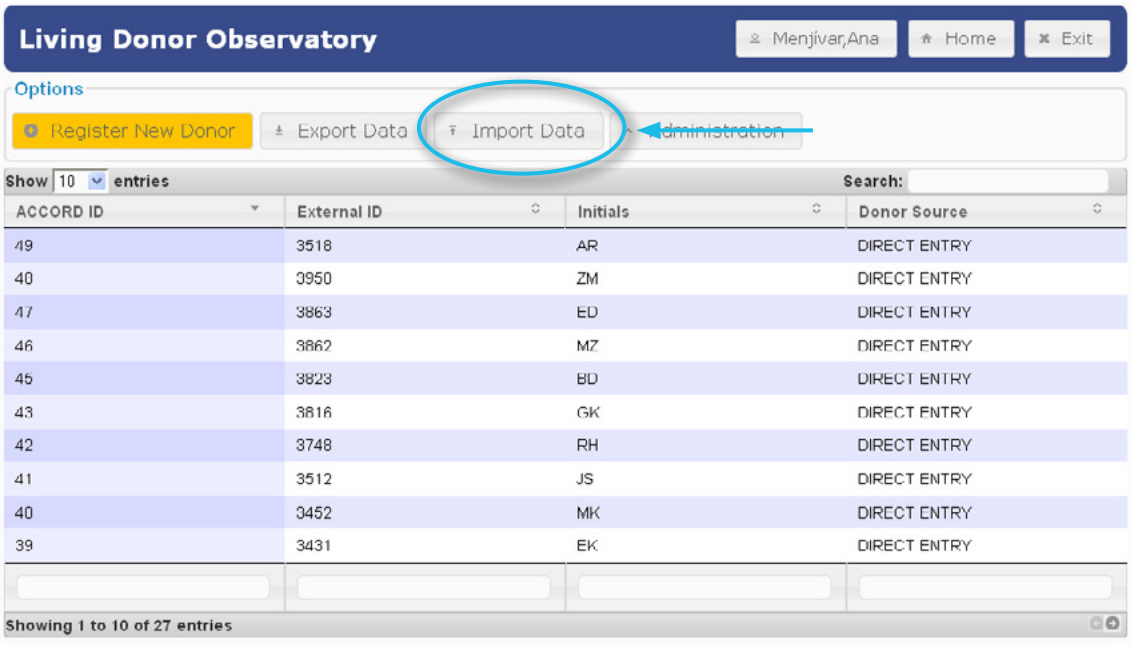


Note: The total number of entries includes all the donors registered in the pilot registry and the system automatically filters the donors of your country.

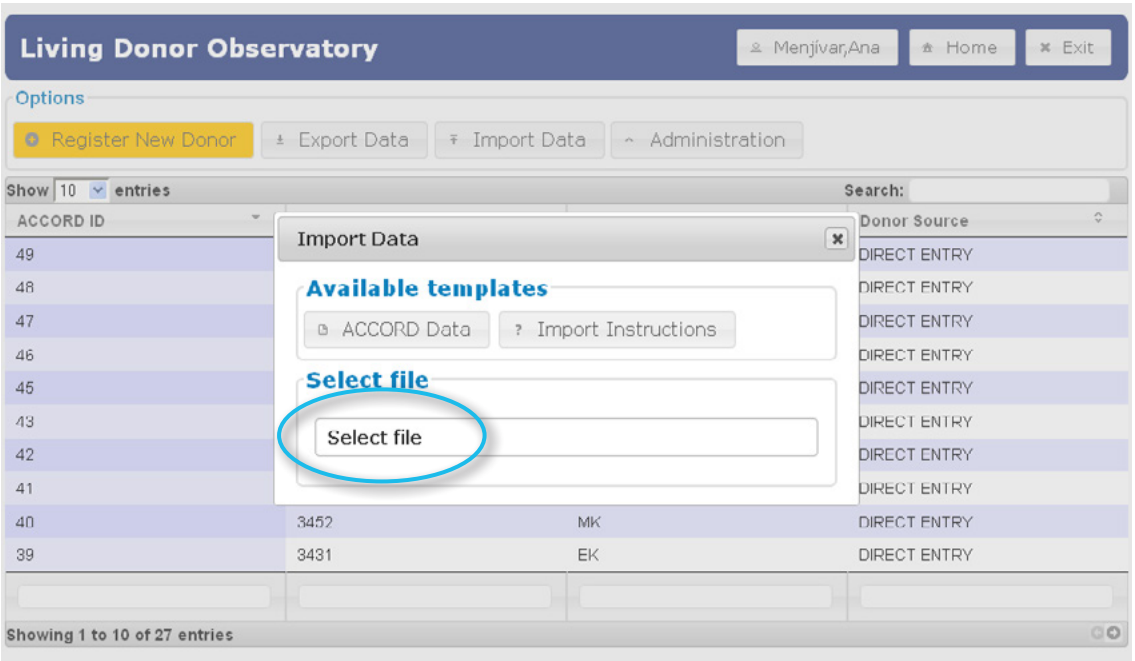
Guide for the import data module

Main page:

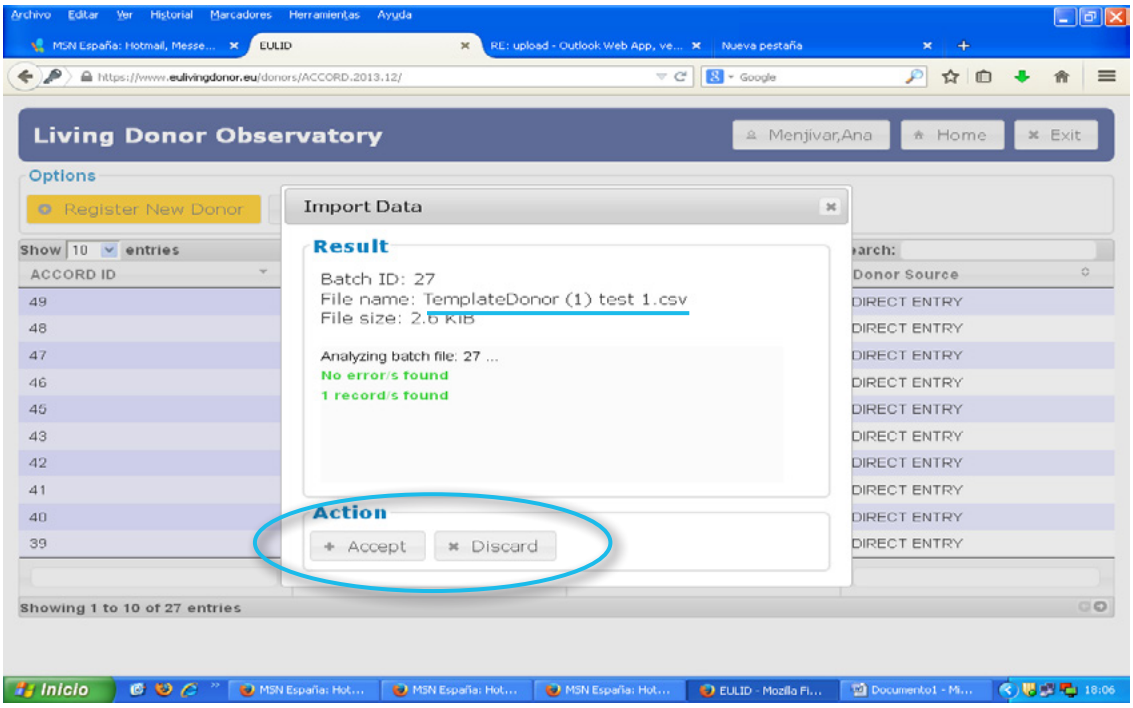
1 Click on "**Import Data**"



2 Select the file to be imported.



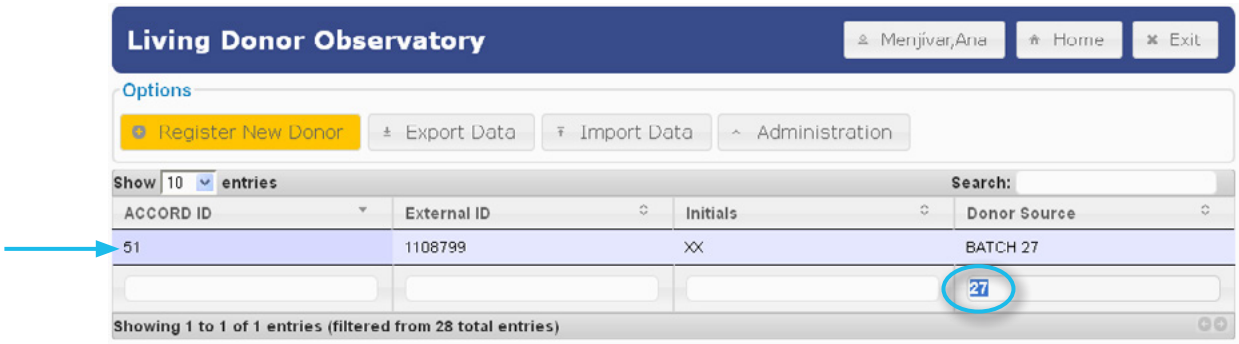
3 When the file is opened the system automatically analyzes the information in order to check any incongruence.
As you could see during this demonstration the system informs: "No error/s found" and offers two different actions: "Accept" or "Discard"



4 When you click :

> **"Accept"** - the information is correctly saved and the system returns to the main page and the new donor just registered appears in the list.
> **"Discard"**- the file will be completely discarded and no data will be loaded into the system.

5 After the data are saved, the IDs of the new/s donor/s will appear in the main page.



Note: After importing a file, to help identifying the imported data, the main screen filters the information by the batch ID (as shown above). To show all the donors again, please remove the batch ID from the search box.

More clarifications:

- In case a modification of the uploaded data is needed it should be done only manually and only going through each donor that needs modification (the respective ID of the donor in the registry). There is no possibility to delete or edit a full batch. Each modification should be done donor by donor.
- The system shows an alert in those cases when the External ID exists already. However, this is just an alert and the user may continue the process (accepting or discarding) the file.
- If you are uploading a file in where an ID is repeated the system does not give any alert. All the responsibility of the data is up to the person who is registering. The data must be checked before being uploaded.

NOTE: Please remember to download and read the instructions that are in the website before uploading any file. In the instruction you may find all the specific information for each variable.

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On behalf of the WP4 ACCORD Consortium

www.accord-ja.eu