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ORIGINAL ARTICLE

Living organ donation practices in Europe – results from an online survey

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Summary

In Europe, living organ donation (LOD) is increasingly accepted as a valuable solution to overcome the organ shortage. However, considerable differences exist between European countries regarding frequency, practices and acceptance of donor–recipient relations. As a response, the Coordination Action project 'Living Organ Donation in Europe' (www.eulod.eu), funded by the Seventh Framework Programme of the European Commission, was initiated. Transplant professionals from 331 European kidney and liver transplant centres were invited to complete an online survey on living kidney donation (LKD) and living liver donation (LLD). In total, 113 kidney transplant centres from 40 countries and 39 liver transplant centres from 24 countries responded. 96.5% and 71.8% performed LKD and LLD respectively. The content of the medical screening of donors was similar, but criteria for donor acceptance varied. Few absolute contraindications for donation existed. The reimbursement policies diverged and the majority of the donors did not get reimbursed for their income loss during recovery. Large discrepancies were found between geographical European regions (the Eastern, the Mediterranean and the North-Western). As a result of this survey we suggest several recommendations to improve quality and safety of LOD in Europe.

Introduction

The organ shortage presents one of the major challenges in organ transplantation. In 2011, a total of 49 477 persons were on waiting lists for kidney transplantation (KT) and 6808 for liver transplantation (LT) in the European Union (EU), while 18 712 KT and 7006 LT were performed [1]. Mortality among those waiting is 15–30%; i.e. approximately 10 deaths daily [2–4]. In Europe, patients wait on average 3–5 years for a deceased donor kidney. To enlarge the donor pool the use of living donors in Europe has increased. This fact was recognized by the European Commission [4], resulting in a directive that defines quality and safety requirements for human organs intended for transplantation [5]. This directive states that 'living donations need to be performed in a manner that minimises the physical, psychological and social risk to the individual donor and the recipient', and that […] the highest possible protection of living donors should be ensured' [5, p. 17].

Living organ donation (LOD) is now an established practice in many European countries, because of the recent advances in surgical techniques, donor screening and

selection [6–11]. In 2011, live donors were used in 20.6% (0–61.3%) of all KT performed in the European Union and in 3.5% (0–50%) of all LT [1]. However, there are large differences across Europe. The Netherlands, Norway and Sweden have high living kidney donation rates (LKD), whereas Poland, Finland and Belgium have low rates [1]. The barriers and incentives to not conduct living donor KT or LT are not well understood. Differences between countries also exist regarding acceptable donor–recipient relationship types, and concerning donor screening and follow-up. Hence, it is currently unclear how European countries put the EU directive into practice to guarantee donor safety.

We therefore launched the Seventh Framework Programme Coordination Action *Living Organ Donation in Europe* (EULOD project) [12], aiming to establish an inventory of European living donation practices, to explore and promote living donation as a way to increase organ availability, and to develop tools that improve the quality and safety of LODs. This study is a part of the EULOD project and the aims were to:

1. Survey the various practices of LOD in Europe.
2. Identify possible legal, ethical and financial considerations of transplant professionals that act as barriers towards LOD.
3. Achieve full European geographical coverage.

Materials and methods

Design and sample

We used a descriptive cross-sectional design. Transplant professionals from kidney and liver transplant centres in all 27 EU member states were invited to complete an online survey. Transplant centres in 18 non-EU member state were also invited when contact information was available. Lung-, bowel- and pancreas transplantations from living donors were excluded as they are in their infancy and thus rarely performed. To guarantee maximal response rates no other specific exclusion criteria were stated.

Survey

Two separate, but similar questionnaires were constructed for living kidney (LKD) and liver donation (LLD), and are published on the EULOD website [12].

With the authors' permission, a US survey on the selection of LKD served as the basis for our questionnaires [13]. The content was revised after extensive literature search, by iterative review rounds and through pilot testing by two transplant professionals. The questions focused on the prevalence and types of living donation performed, surgical techniques, possible barriers towards living donation, screening of potential donors, reimbursement and follow-up policies.

Types of donor–recipient relationships were classified according to the recently published taxonomy of the *Ethical Legal and Psychosocial Aspects in organ Transplantation* (ELPAT) Working Group on Living Organ Donation [14].

The online surveys were programmed in examinare© (www.examinare.com). Data are protected by Secure Socket Layer and information between server and browser was encrypted.

Approval was obtained from the ethical review board of the Katholieke Universiteit Leuven in Belgium on 24 February 2011.

Procedure

The networks of the EULOD consortium, ELPAT and European Society of Organ Transplantation were used to create a list of transplant professionals from European liver and kidney transplant centres. From March to December 2011, invitation letters were sent to 249 kidney and 106 liver transplant professionals, including information on confidentiality and a link to the online survey. Three reminders were sent in the case of nonresponse.

Statistical analysis

Nominal and ordinal results are presented as percentages. Centres were grouped into three geographical regions: Northwest, Mediterranean and East Europe. Where appropriate, responses between regions were compared using chi-square for nominal and Kruskal–Wallis testing for ordinal variables, using the statistical software SPSS version 19.0. Statistical significance was set at $P < 0.05$. Given that these analyses were exploratory in nature, we did not control for multiple testing. To be complete, kidney transplant centres from the 27 EU member states were compared with centres from the non-EU member states, but are not further addressed in this manuscript. Numbers were too small to make meaningful comparisons for LT.

Results

The survey was sent to 331 professionals in 45 countries. Out of the 27 member states, we received replies from kidney and liver transplant centres from 25 and 18 countries respectively. Out of the 18 nonmember states contacted, 15 responded to the kidney and six to the liver donation survey (Table 1). In total we received 152 replies representing the same number of transplant programmes. The majority of the responders were transplant surgeons, nephrologists or transplant coordinators. Of the participating centres, 95.5% performed LKD. LKD was practised in all responding EU member states and in all but two nonmember states. LLD programmes were reported by 28 (71.8%) of the 39

Table 1. In total 331 surveys were sent to transplant professionals in 45 European countries. By January 2012, 113 kidney transplant units from 40 countries and 39 liver transplant units from 24 countries had completed the survey. Four replying centres did not have a living kidney donor programme and 11 replying centres did not have a living liver donor programme, these are marked [bold-]. The replies are grouped into three geographical regions, i.e. the Northwest, the Mediterranean and the East. Bold country = EU- member.

Surveys sent	**Replies** [kidney/liver]	**East**	***Surveys sent***	**Replies** [kidney/liver]	
Northwest					
Austria	(5)	[1/1]	Albania	(1)	[1/0]
Belgium	(14)	[7/4, **1-**]	Armenia	(1)	[1/0]
Denmark	(6)	[3/1]	Belarus	(3)	[1/0]
Finland	(1)	[1/0]	Bosnia Herzegovina	(3)	[1/0]
Germany	(50)	[16/3, **1-**]	**Bulgaria**	(5)	[1/0]
Iceland	(1)	[1/0]	Croatia	(6)	[2/1]
Luxembourg	(1)	[0/0]	**Czech Republic**	(11)	[3/0]
Netherlands	(11)	[7/2]	**Estonia**	(1)	[1/0]
Norway	(2)	[1/**1-**]	Georgia	(1)	[1/0]
Republic of Ireland	(1)	[1/0]	**Hungary**	(6)	[2/**1-**]
Sweden	(7)	[4/2]	Kazakhstan	(1)	[0/0]
Switzerland	(10)	[3/0]	Kosovo	(4)	[0/0]
UK	(35)	[17/5]	**Latvia**	(2)	[1/1]
			Lithuania	(2)	[1/1]
			Moldova	(1)	[**1-**/0]
			Montenegro	(1)	[**1-**/0]
Mediterranean					
Cyprus	(2)	[0/0]	**Poland**	(21)	[5/1, **1-**]
France	(20)	[2/**1-**]	**Romania**	(8)	[1/1]
Greece	(7)	[2, **1-**/**1-**]	Russian Federation	(10)	[2/**1-**]
Italy	(7)	[4/1, **1-**]	Serbia	(7)	[4/0]
Malta	(2)	[1/0]	**Slovakia**	(2)	[2/0]
Portugal	(9)	[1/**1-**]	**Slovenia**	(2)	[**1-**/1]
Spain	(32)	[5/1]	Former Yugoslavian Republic of Macedonia	(1)	[1/**1-**]
			Turkey	(2)	[1/1]
			Ukraine	(6)	[0/0]

participating centres, representing 14 EU member and three nonmember countries.

Living kidney donation

The majority of kidney centres ($N = 65$; 60%) performed <25 LKD transplantations yearly, while 12% did >50 and of those, two centres did >100 (i.e. one in the Netherlands and one in Turkey). In comparison, the majority (52%) of the responding centres performed more than 51 KTs annually with an organ from a deceased donor. The number of transplants performed with living donors equals the number performed with deceased donors in 32 centres (29%), and only five centres were conducting more LKD than deceased donor transplants (5%). While the number of transplantations from deceased donors was about the same in all regions ($\chi^2 = 8.0$; $P = 0.63$), the proportion of transplantations performed with living donors differed significantly ($\chi^2 = 17.8$; $P = 0.023$) (Table 2).

Almost all centres applied a minimal donor age of 18 years (92.7%), and eight centres accepted minors as donors (7.3%). An upper age was not used as medical exclusion criterion in 57.8%, yet 33.8% would not accept donors above 70 years old. Glomerular filtration rate was measured in all but four centres. The cut off was 80 ml/min in 41.9%, 75 ml/min in 18.1%, 70 ml/min in 19% and 65 ml/min in 21% of the centres. The Eastern centres seem to use less strict medical donor criteria compared with the Northwest, and to a lesser extent Mediterranean countries, although most differences did not reach statistical significance (Table 2).

59.6% performed a routine predonation psychological screening by psychiatrists or psychologists for all potential donors, 26.6% only did this if problems were identified or suspected. Psychiatric disease or personality abnormalities constituted absolute contraindications in the majority of centres.

Specified direct donation [14] was the predominant donor–recipient relation in all centres (Table 3). Most centres accepted genetically related family, spouses and partners. Donation to a genetically and emotionally unrelated recipient, with certain recipient characteristics, e.g. a child, was allowed in four centres, all from the

Table 2. Results from living kidney donor (LKD) survey divided in geographical regions in Europe.

	Living kidney donor programmes (N = 109)						
	North-west (N = 62)	Mediterranean (N = 15)	East (N = 32)	P-value	EU member (N = 89)	Non-EU member (N = 20)	P-value
LKD transplantations							
<25 LKD/year	28 (45)	11 (73)	26 (81)	P = 0.023	49 (55)	16 (80)	P = 0.042
Absolute contraindication for LKD							
Diabetes type 1	60 (97)	12 (80)	24 (75)	P = 0.045	80 (90)	16 (80)	P = 0.112
Diabetes type 2	48 (77)	11 (73)	19 (59)	P = 0.142	66 (74)	12 (60)	P = 0.295
BMI >40	55 (89)	13 (87)	24 (75)	P = 0.340	75 (84)	17 (85)	P = 0.892
BMI >35	39 (63)	9 (60)	14 (44)	P = 0.388	52 (58)	10 (50)	P = 0.398
BP >140/90 mmHg	12 (19)	2 (13)	7 (22)	P = 0.555	17 (19)	4 (20)	P = 0.022
Well-treated hypertension	2 (3)	0 (0)	3 (9)	P = 0.428	3 (3)	2 (10)	P = 0.375
Urine protein >300 mg/24 h	40 (65)	11 (73)	18 (56)	P = 0.527	58 (65)	11 (55)	P = 0.526
Surgical techniques							
Open flank incision, rib resection	9 (15)	2 (13)	18 (57)	P = < 0.001	21 (23.1)	10 (45.5)	P = 0.035
Laparoscopic techniques	50 (81)	8 (50)	12 (37)	P = <0.001	61 (67)	10 (46)	P = 0.060
Reimbursement	41 (66)	3 (20)	6 (19)	P = <0.001	46 (52)	13 (65)	P = 0.280
Donor follow-up	62 (100)	15 (100)	13 (40)	P = < 0.001	86 (97)	18 (90)	P = 0.074
Donor registries, national level	60 (97)	14 (93)	26 (81)	P = 0.034	58 (64	8 (36)	P = 0.019

Values in parentheses are percentages.

Northwest region. Selecting a certain recipient was allowed only in one centre. Specified indirect donation – i.e. when the donated kidney is used in an exchange programme – was practised in 43.1% of the centres. Unspecified donation (i.e. donation to an anonymous and unspecified recipient), was performed in 35 centres but was far more common in North-western countries. The medical screening of unspecified donors was identical to that of specified direct donors in 45% of the centres. When additional screening was included, it generally consisted of psychiatric/psychosocial evaluation. Forty centres from 13 countries started specified indirect and unspecified LKD programmes started during the last decade. Most centres performed 10 or less such donations since the start, except for two centres that performed more than 50 cases each.

While preparing the donor, commonly both written (93.8%) and verbal information (78.8%) about LKD was given. Audio-visual information techniques (e.g. DVDs, websites), were used by 38.9%. In almost all centres, this information included a description of legal conditions, evaluation process, surgical procedure, recovery period, possible short- and long-term donor complications and risks involved for the recipient. 64.6% provided information on reimbursement and all centres required informed consent prior to LKD.

Several surgical techniques were used for LKD, with some centres using more than one technique and geographical differences being observed (Fig. 1).

Fifty-four per cent did not reimburse kidney donors for their expenses, yet large discrepancies exist within Europe (see Table 2). In the remaining centres, income loss during recovery (86%) and hospital stay (84%) was mostly reimbursed. Income loss during work up, costs for the evaluation process, hospital stay or postoperative follow-up were reimbursed in 54–76% of centres. This also differed between regions (Table 2).

All but three centres (in Croatia, Lithuania and the Russian Federation) offered postoperative follow-up. In 67.3% of the centres this was life-long. Again, large differences existed between regions. The check-up included medical tests in all centres that organized follow-up programme and psychosocial follow-up in 17%. Donor data registries were kept by 91.7%. 20.5% also reported to European registries. The most frequently registered data, apart from identity and relation to the recipient, were pre-operative medical data and postoperative complications.

Living liver donation

Living liver donation seemed to be performed more frequently in North-western (86.4%), followed by Eastern European countries (63.6%), with LLD being performed in one-third of responding Mediterranean countries (33.3%) (χ^2= 7.0; P = 0.029).

Two-thirds of centres (64.3%) performed $\leq$5 LLD transplantations annually. Remaining centres never performed more than 25.

Table 3. Types of relations accepted between donor and recipient divided by geographical region and categorized based on ELPAT's classification for living organ donation [14].

	Living kidney donor programmes (*N* = 109)				Living liver donor programmes (*N* = 28)			
	North-west (*N* = 62)	Mediterranean (*N* = 15)	East (*N* = 32)	*P*-value	North-west (*N* = 19)	Mediterranean (*N* = 2)	East (*N* = 7)	*P*-value
Type of relationship accepted								
Specified donation, direct								
Person who donates directly to his or her intended recipient								
Parent	62 (100)	15 (100)	32 (100)	$P = 0.07$	19 (100)	2 (100)	7 (100)	$P = 1.00$
Sibling	62 (100)	10 (66)	30 (94)	$P < 0.001$	14 (74)	1 (50)	6 (86)	$P = 0.57$
Child (adult)	51 (82)	3 (19)	17 (49)	$P < 0.001$	11 (58)	0 (0)	4 (57	$P = 0.29$
Grandparent	58 (94)	11 (73)	27 (84)	$P = 0.014$	14 (74)	1 (50)	3 (43)	$P = 0.31$
Other genetically related	58 (94)	12 (80)	26 (81)	$P = 0.019$	16 (82)	1 (50)	4 (57	$P = 0.26$
Spouse	61 (98)	13 (87)	23 (72)	$P < 0.001$	16 (84)	2 (100)	7 (100)	$P = 0.45$
Partner	61 (98)	14 (93)	16 (50)	$P < 0.001$	16 (84)	1 (50)	4 (57)	$P = 0.26$
Other nongenetically related family/relative	55 (89)	8 (53)	11 (34)	$P < 0.001$	11 (58)	1 (50)	2 (29)	$P = 0.41$
Friend with close emotional relationship to recipient	57 (92)	8 (53)	10 (31	$P < 0.001$	13 (68)	1 (50)	3 (43)	$P = 0.47$
An employer or supervisor of recipient	27 (27)	0 (0)	1 (3)	$P = 0.001$	3 (16)	0 (0)	1 (14)	$P = 0.83$
An employee or supervisee of recipient	16 (26)	1 (7)	1 (3)	$P = 0.006$	3 (16)	0 (0)	0 (0)	$P = 0.45$
Co-worker	26 (42)	1 (7)	2 (6)	$P < 0.001$	3 (16)	0 (0)	1 (14)	$P = 0.83$
Acquaintance without close emotional relationship to recipient	21 (34)	1 (7)	1 (3)	$P < 0.001$	3 (16)	0 (0)	1 (14)	$P = 0.83$
A stranger donating anonymously to a specific recipient e.g. a famous person	1 (2)	0 (0)	0 (0)	$P = 0.66$	2 (11)	0 (0)	1 (14)	$P = 0.85$
A stranger anonymous to a recipient with defined characteristics e.g. a child	4 (7)	0 (0)	0 (0)	$P = 0.18$	3 (16)	0 (0)	1 (14	$P = 0.83$
Specified donation, indirect								
Person who donates indirectly to his or her intended recipient								
Pared exchange 'organ swopping'	35 (57)	7 (47)	5 (16)	$P < 0.001$	5 (26)	0 (0)	1 (14)	$P = 0.60$
Unspecified donation								
Donation to an anonymous and unspecified recipient								
A stranger anonymous to any recipient	31 (50)	3 (20)	1 (3)	$P < 0.001$	6 (32)	0 (0)	1 (14)	$P = 0.46$

Values in parentheses are percentages.

Table 3 lists the accepted donor–recipient relationships per region, although comparisons need to be interpreted with caution because of the small number of centres with LLD programmes. Specified indirect donation – in an exchange programme – was an accepted practice in six (21.4%) and unspecified (anonymous) donation in seven centres (25%). However, only eight such donations in seven centres from four countries had actually been performed. Donating anonymously to a defined recipient with certain characteristics was permitted in four centres and to select a certain recipient in three.

All centres had a minimal donor age of 18 years, while no upper age limit existed in 31.1% but 57.2% did not allow donors above 60 years old. Diabetes type 1 would preclude LLD in 60.7% of the centres, BMI >35 in 78.6% and BMI >40 in 89.3%. Liver steatosis in the donor was accepted in a range varying from none in three centres (11.5%) to more than 10% in seven (26.9%).

82.1% of centres included routine predonation psychological screening, and otherwise when problems were identified. As for the kidney donors, both verbal and written information on LLD was provided, with similar contents.

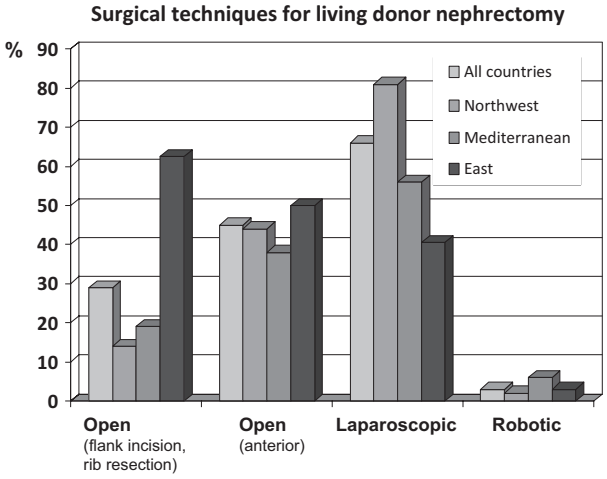

Figure 1 Surgical techniques for living donor nephrectomy were categorized into four groups. More than one technique was used in a number of the centres. This figure shows the surgical techniques used in % (n = 109) divided into the three geographical regions as shown in Table 1.

The majority of the liver donors (67.9%) did not get any reimbursement for income loss or other expenses.

All centres obtained informed consent prior to donation. All but one centre had a medical postoperative donor follow-up. In nine centres this was intended to be life-long (32.1%). Donor registries were kept by all but one centre; of which 10 (37%) reported also to national and five (18.5%) to European registries.

Barriers to living kidney and liver donation programmes

Only four of the responding 113 KT programmes did not have a LKD programme, but planned to start one, and saw no barriers to that. Eleven out of 39 responding LT centres did not have an LLD programme for the following reasons:

1. Financial barriers.
2. Sufficient supply of livers from deceased donors.
3. It had never been discussed at the centre.
4. Negative attitudes among healthcare professionals.
5. Lack of surgical expertise.

Discussion

This study is unique as practices in LOD in European countries have not previously been studied to this extent. The response rate was impressive, and we reached almost full geographical coverage, including both EU member and nonmember states, reflecting a high interest in the topic. When comparing our findings with a similar survey in 132 US kidney transplant programmes (Table 4), we observed differences in absolute contraindications for donor age (>70 years), treated hypertension, urine protein and GFR rate between both continents [13,15]. Also, psychosocial screening was mandatory in 74% of US centres, compared to 59.6% in Europe. European centres were also more reluctant to consider employers, co-workers or employees, acquaintances without an emotional relationship to the donor or anonymous strangers as potential living donors.

Our survey generated several additional interesting insights both on kidney and living donation across Europe.

Table 4. Comparison of results of survey in 132 US kidney transplant centres [13,15] versus our survey in 109 European kidney transplant centres.

	European survey	US survey (based on Mandelbrot *et al.* [13] & Rodrigue *et al.* [15])
Medical absolute contraindications for donation		
Donor age <18 years	93%	98%
No upper age limit	58%	59%
Donor age >70 years	34%	9%
Diabetes type II	72%	64%
Obesity BMI >35	57%	52%
Obesity BMI >40	84%	72%
Treated hypertension	5%	47%
Urine protein >300 mg/24 h	63%	44%
GFR <80 ml/min/1.73 m^2	42%	67%
Psychosocial screening		
Mandatory for all donor candidates	60%	74%
Accepted donor–recipient relationship		
Parent	100%	100%
Spouse	89%	100%
Employee or supervisee	17%	61%
Co-worker	27%	92%
Employer or supervisor	26%	64%
Acquaintance without emotional relationship with the recipient	21%	74%
A stranger anonymous to any recipient	32%	61%

Donor selection and safety

The WHO states that, 'Live donations are acceptable when the donor's informed and voluntary consent is obtained, when professional care of donors is ensured and follow-up is well organized, and when selection criteria for donors are scrupulously applied and monitored' [16, p. 3]. Furthermore, the EU directive lists requirements to ensure protection of the live donor [5]. Our results show that some requirements regarding donor selection and safety are not always met, that selection criteria are not uniform and sometimes not sufficiently restrictive. In 25% of the Eastern European centres, diabetes type 1 was not an absolute con-

traindication for LKD, which is incongruent with the directives, as diabetes is a commonly leading to end-stage renal failure. Twenty-five per cent of the Eastern European centres also accepted donors with a BMI >40, while most international guidelines consider this as an absolute contraindication, although this issue is currently being debated [17].

Several randomized studies demonstrate that laparoscopic donor nephrectomy (LDN) is safe and is to be preferred over other approaches [18–20], since it results in less pain, shorter hospital stay and convalescence time [21]. The results of this survey clearly demonstrate that many centres (especially in the Eastern region) still need to implement LDN.

Our LLD results show that 63% of centres performed ≤ 5 donor hepatic lobectomies annually. LLD requires a high level of surgical skills and understanding of the complex anatomy of the liver [22]. With the low number of procedures per centre, the donor safety may be a concern.

Moreover, we found large disparities regarding LKD between European regions, with a low volume in most Eastern and Mediterranean centres. This shows a large potential for increasing the number of LKD in many countries. Yet, to achieve the best possible quality and safety for the living donor, such programmes should be centralized, avoiding presence of low-volume centres, to enable the transplant team to develop the highest level of experience in all phases of the donation process.

Reimbursement

Only few Mediterranean or Eastern European countries reimburse kidney donors for their expenses. This might reflect the reluctance of European governments to implement compensation policies for living donors, although The WHO guiding principles permits reimbursement for 'reasonable and verifiable expenses incurred by the donor, including loss of income' [16, p. 5]. The European Convention on Human Rights and Biomedicine also states that the prohibition of financial gain 'shall not prevent payments which do not constitute a financial gain or a comparable advantage' [23]. We believe that Competent Authorities in many countries are not aware that this is legally acceptable. The economic crisis might argue against reimbursement of costs, yet, given that most patients in most European countries are waiting more than 5 years for deceased donor KT, the reimbursement of costs to the donor does not outweigh the huge costs associated with dialysis treatment and its associated poorer outcomes [24]. However, the financial stability, as well as healthcare system organization, needs to be taken into consideration when designing European or national reimbursement policies.

Follow-up

Most participating centres have follow-up programmes. Although most keep living donor registries, many do not report on a national level. As for all surgical procedures, LOD is associated with risks for morbidity and mortality [22,25–27]. Medical and psychosocial follow-up programmes and registries of living organ donors should therefore be mandatory. This is also encouraged by the WHO guiding principles, the Declaration of Istanbul and the EU Directive [5,16,28]. To increase the knowledge about long-term consequences and to guarantee safety of future living organ donors, lifelong follow-up is required. Registries on living organ donors should be implemented and regularly monitored on a national level**.** At a minimum these registries should report information concerning serious adverse events after donation.

Barriers to living donation

In this study, few barriers for increasing living donation were mentioned. Because of the economic crisis in many European countries the financial barrier seems challenging to overcome. However, LKD is by far more cost effective than dialysis treatment [24,29,30]. Furthermore, LT is also a life-saving therapy and the benefits with LLD transplantation for the liver recipient cannot be overlooked.

With this survey, we explored type of donor–recipient relationships accepted for the first time. Although not explicitly reported as barriers in our survey, various legal and societal hurdles towards several types of donation (e.g. unspecified donation to a stranger) might exist in many countries. Several bodies recommend removing these barriers and focusing on 'safety by procedures' [31]. This process will largely depend on the country's willingness to modify restrictions. Possibly the involvement in cooperative endeavours such as the EULOD project might open up discussions and encourage them to give up these restrictions.

Methodological limitations

Although a complete coverage of the EU member states was attempted, and 25 of the 27 states did respond, not all centres within each country responded, making comparisons between countries impossible. It is also likely that centres without a living donor programme were less prone to respond. Furthermore, despite our efforts in contacting transplant professionals (n = 331), fewer responded from the Mediterranean and Eastern European countries. The fact that the survey was in English might have been an obstacle.

Recommendations

The European Commission puts organ donation and transplantation high on their policy agenda and, alongside other strategies to overcome organ shortage, strongly advocates the use of living donors to overcome organ shortage, under the condition that a legal framework is in place and that safety for both the donor and recipient is guaranteed [5]. In line with existing directives and as a result of this survey, we suggest the following points to improve the quality and safety of LOD and increase overall organ availability in Europe:

1. Consensus should be reached within Europe which major medical contraindications to be used, based on empirical evidence and follow-up data of live donors and recipients.
2. Centres should demonstrate sufficient volume of surgical procedures and training (especially live donor nephrectomy) to ensure a high level of surgical skills, and state-of-the-art care for the living donor.
3. Reimbursement should be offered to all living donors. Governments should be made aware of what is legally acceptable and the EU should encourage them to implement these policies.
4. Irrespective of centre volume, donor quality and safety could be increased by documenting serious adverse events and morbidity. National or European mandatory registries could be a platform to do so, although the content and consequences of such registries need to be carefully discussed and adopted by the European transplant community, taking historical, economic, cultural and healthcare system-related factors into consideration.

Author ship

AL: designed the research, collected data, performed the research, performed the data analysis and wrote the paper. CL: participated in research design, collected data, participated in performance of the research, participated in data analysis, participated in writing the paper. FJMKD: participated in performance of the research, in the data analysis and in writing the paper. FA, ND, MF, AP, WZ: participated in research design, performance of the research and in writing the paper. WW: participated in research design and in writing the paper. FD: designed the research, participated in data collection, participated in performance of the research, performed the data analysis and the statistical analysis, wrote the paper.

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