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Germany's Path to a National Kidney Exchange Program: An Assessment of the 2024 Legislative Proposal

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ABSTRACT

Background: Kidney exchange programs (KEPs) facilitate organ exchanges among multiple donor–recipient pairs, enabling recipients to obtain immunologically well-matched kidneys through coordinated donor swapping. Despite the demonstrated benefits of such programs, Germany remains the only highly populated EU country in which kidney exchange is permitted only under very restrictive conditions.
Reform context: In July 2024, the German Federal Cabinet approved draft legislation to amend the 1997 Transplantation Act, with the establishment of a national kidney exchange program (KEP) as one of its primary objectives. The Federal Parliament is expected to deliberate on the draft and consider potential revisions in 2026.
Expected Results: The proposal is expected to alleviate the shortage of donor organs by mandating full nationwide participation from all transplant centers and by allowing longer exchange cycles as well as chains initiated by non-directed donors. In this paper, we present several international case studies and recent statistical evidence from European KEPs that highlight the potential benefits of including compatible donor–recipient pairs—a feature that is currently absent from the draft legislation.
Conclusion: We believe that the draft law's exclusion of compatible donor–recipient pairs may ultimately undermine transplant quality, limit access, and reduce overall program efficiency. We therefore recommend a modest but essential amendment to the legislation before it is submitted for final approval by the Federal Parliament.

Research in Context

1. What is already known about the topic? The 2024 draft legislation introduced by the German Federal Cabinet aims to reform the Transplantation Act with the primary objective of establishing a national kidney exchange program in Germany. This initiative is widely expected to help reduce the country's persistent organ shortage by facilitating more efficient allocation of living-donor kidneys.

2. What does this study add to the literature? This study provides the first comprehensive analysis of the proposed 2024 German kidney exchange legislation in the context of existing theoretical and empirical evidence on kidney exchange programs. It critically evaluates the draft law's core design features and illustrates their potential consequences using international case studies and recent European data. Furthermore, it highlights the substantial benefits of including compatible donor–recipient pairs—a policy option currently omitted from the draft and largely absent from German public and academic discussion.

3. What are the policy implications? Germany's forthcoming transplantation law has the potential to significantly strengthen both domestic kidney transplantation and cross-border kidney exchange collaboration within Europe. To achieve these gains, the legislation should align with established best practices in other European programs by permitting compatible donor–recipient pairs to participate in the national exchange system.

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1. Background

1.1. Brief history of kidney exchange programs (KEPs)

Kidney exchange programs (KEPs) were initially developed to support patients who have a willing but immunologically incompatible living donor. These programs coordinate exchanges among multiple donor–recipient pairs, allowing each recipient to obtain a compatible kidney through a structured donor-swap system. Over time, the inclusion of compatible donor–recipient pairs has further enhanced match quality, particularly with respect to donor age and human leukocyte antigen (HLA) compatibility.

The first national KEP in Europe was established in the Netherlands in 2004. The largest current programs are in the UK and Spain, which were established in 2007 and 2009, respectively. Details of European KEPs were surveyed as part of the European Network for Collaboration on Kidney Exchange Programs COST Action (ENCKEP 2016–2021) [1], with a subsequent comparative analysis focusing on the optimization objectives, including, among others, the total number of transplants in a round, the quality of the transplants (relative to specific measures), the simplicity of performing the exchanges, and the prioritization of hard-to-match recipients to improve equity and to avoid the accumulation of these recipients in the KEP pool [2].

1.2. The 1997 German Transplantation Act

Germany is the last high-population country in the European Union where no KEP is organized by the state. Moreover, kidney exchange is permitted only under the very restrictive circumstances described in the 1997 German Transplantation Act, which remains in effect. This act requires that, in the case of a pairwise kidney exchange (see the first picture in Figure 1), the living donor must have a very close personal connection to the recipient who receives their organ, rather than to the recipient with whom the donor is registered as a (potentially incompatible) donor–recipient pair.

Despite this, the first pairwise kidney exchange—and, to our knowledge, the first European kidney exchange—was conducted in 1999 between a German and a Swiss pair at Basel University Hospital [3]. However, this case sparked significant debate, as the German pair was initially denied reimbursement by their insurance company, which argued that the procedure was illegal under German law. Since then, only a limited number of pairwise exchanges have taken place in Germany: three at the University Hospital in Cologne in 2017, 2022, and 2024; one at the University Hospital in Freiburg in 2023; and two at Charité University in Berlin in 2007 and 2021. In all instances, the participating pairs were required to demonstrate a very close personal relationship. To illustrate the challenges these patients encountered, we provide a detailed account of the 2021 Berlin case [4].

A large, patient-organized initiative (https://crossover-nierenspenderliste.de) maintains a database of recipient–donor pairs and generates virtual crossmatches based on information uploaded by the pairs themselves. This initiative identified two matching pairs and subsequently contacted Charité University in Berlin. After a successful physical crossmatch in Berlin, the pairs met several times during the pandemic—despite significant travel distances—and documented each meeting. However, the ethics committee initially declined to approve the donation because it did not find sufficient evidence of a close enough relationship between the pairs. Interestingly, while the committee explicitly ruled out any suspicion of organ trade and acknowledged the altruistic nature of the initiative, it noted that the "spontaneous personal sympathy" between the pairs could potentially form the basis for meeting the required criteria in the future; nonetheless, determining this was beyond their expertise. After several additional meetings over a six-month period, coupled with documented deterioration in the recipients' health, the committee ultimately approved the transplants.

2. The 2024 German transplantation draft law

Despite having a modern healthcare system, the situation for kidney patients in Germany is the most challenging among the eight Eurotransplant countries. Currently, approximately 100,000 patients are undergoing dialysis, and 6,397 patients are on the waiting list, which has an average waiting time of eight years [5].

This situation has placed considerable pressure on policymakers to increase the availability of organ transplants without intensifying the controversy surrounding deceased donations or weakening protections for living donors. The meticulously crafted 2024 draft law takes several important steps in this direction. Its central objective is to establish a centrally funded national KEP, which may eventually join international programs, potentially saving hundreds of lives in the years to come. The KEP requires a close relationship between the donor and the recipient who enter the database together, while removing the same requirement for the donor and the recipient who receives the organ through an exchange. In addition to this critical change, the proposed KEP will include the following beneficial features:

- *Compulsory participation and full reporting by all transplant centers.* A fragmented KEP results in significant efficiency loss, as evidenced by US data [6]. The United States has three competing nationwide KEPs; moreover, the majority of exchanges are carried out at individual transplant centers, resulting in a relatively decentralized system. A policy analysis conducted by Ashlagi et al. [7] in the German context utilized simulations to demonstrate the substantial benefits of having a fully centralized program on the number of achievable transplants.

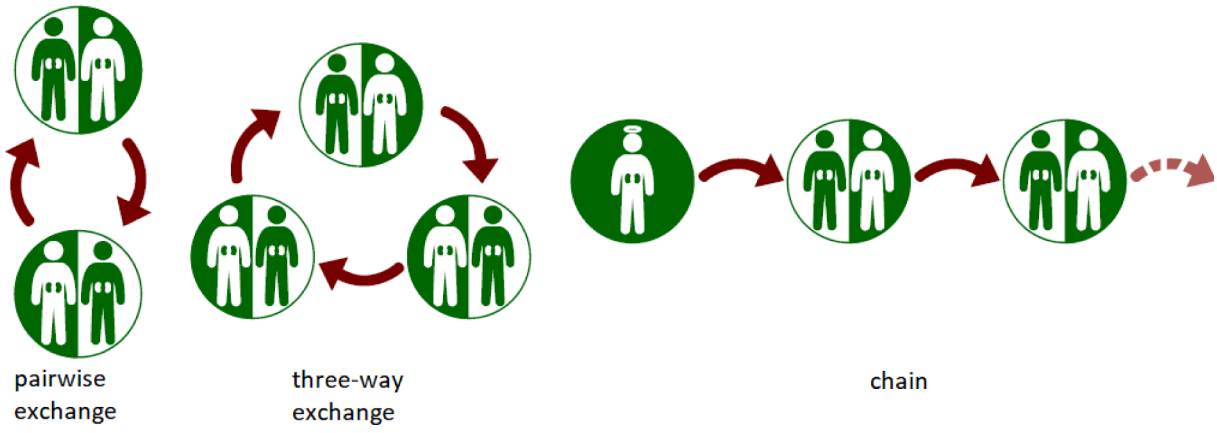

Figure 1. The types of kidney exchanges: pairwise exchange, three-way exchange, and a chain starting from a non-directed donor.

- *Longer exchange cycles are permitted*. In certain European countries, such as Hungary, only pairwise exchanges are legally allowed, which significantly restricts the transplant options available to participants. French regulations similarly limited exchange cycles to two until 2021, when a new bioethical law introduced the possibility of three-way exchanges. This legislation also allowed for chains initiated by the donor of a pair whose recipient received a deceased-donor kidney with an excellent age and HLA match. The substantial benefits of utilizing three-pair exchange cycles, as opposed to only two, were once again demonstrated in simulations conducted by Ashlagi et al. [7] for Germany.
- *Non-directed donors are permitted and primarily utilized for transplant chains*. The concept of using non-directed donors to initiate such chains was first proposed in the United States [8]. In the U.S., the majority of transplants performed within KEPs occur through these chains, and in the UK the proportion of chain-based transplants is approaching 50%. The German draft law has been updated to prioritize these chains over direct donations to the deceased-donor waiting list when a non-directed donor registers, as recommended in the policy proposal by Ockenfels, Sönmez and Ünver [9].

However, the draft law explicitly prohibits compatible pairs from joining the program. We strongly recommend removing this restriction, allowing compatible pairs to enter the pool and take part in a kidney exchange if it offers the recipient a better organ than direct donation would.

3. Recommendation: Allowing compatible pairs to join the program

First, we discuss the volatility of the compatibility paradigm and then share the most significant findings from studies on the effects of allowing all pairs to join the KEP.

3.1. What is compatibility?

First, there is no strict medical definition of compatibility, and the draft law [10] is also somewhat vague on this topic. It states that "an incompatible organ donation pair is an organ donation pair in which immunological reasons prevent the transfer of an organ from the donor to the recipient." It further explains, "The decisive criteria for immunological compatibility are primarily the blood group (ABO) compatibility between the donor and a potential recipient, or the absence of donor-specific anti-HLA antibodies in the blood of a potential recipient." (Translation from German to English by DeepL.) In addition to ABO and HLA compatibility, other factors, such as the donor's age and the size of the kidney, are also important.

While ABO and HLA compatibility are traditionally considered the most critical requirements for compatibility, both ABO-incompatible (ABOi) and HLA-incompatible (HLAi) transplants can be successfully performed with specific desensitization treatments. These treatments typically involve additional risks, higher costs, and slightly reduced expected graft survival rates. In the UK, between 2001 and 2012, the 5-year transplant survival rates for 522 HLAi, 357 ABOi, and 7,290 standard living donor transplants, 5-year transplant survival rates were 71% for HLAi, 83% for ABOi, and 88% for standard transplant [11]. The estimated additional cost of an ABOi transplant in the US, based on data from 2000 to 2011, is $86,000 within three years post-transplant and $126,000 within ten years, compared to a compatible transplant [12]. Cost estimates in Germany are similar [13]. In Germany, the proportion of ABOi transplants was 24.3% in 2023. At the Freiburg transplant center alone, 346 ABO-compatible transplants and 137 ABOi transplants were performed between 2004 and 2019 [14]. Based on these figures, HLAi and, particularly, ABOi pairs can be viewed as fitting into a third category of not fully compatible, but potentially compatible pairs, for whom an exchange may yield a better organ match and lower risks – at reduced costs.

The most widely used quality index for living donation is the Living Kidney Donor Profile Index (LKDPI) [15]. This index suggests that an ABOi donor who is well-matched in other aspects—such as HLA matching, age, size, and sex—may provide better outcomes for a recipient than an ABO-compatible donor with poor HLA matching, advanced age, and differing sex. This perspective has led medical experts to challenge the traditional paradigm of compatibility [16], particularly as new technologies, such as eplet/epitope-matching are being developed to enhance the prediction of compatibility and the quality of transplants. Furthermore, they argue that the objective of a KEP should be to improve the quality of transplanted kidneys for both incompatible and compatible pairs.

3.2. The effect of including compatible pairs

A larger pool yields better and/or more matches; therefore, ABOi and HLAi pairs would clearly benefit from including compatible pairs in the pool. Two recent U.S. studies show that ABO- and HLA-compatible pairs also gain by enrolling in a KEP and receiving higher-quality transplants—without any compromises. The first study was conducted at a single center [17], and the second involved the National Kidney Registry (NKR), the largest nationwide KEP [18]. The latter identified 154 compatible pairs who received transplants through the program between 2013 and 2019. The most common self-reported reasons for enrolling included improving transplant quality, enhancing the HLA-matching score, donor age, and kidney size. As a result, these pairs received much younger exchange donors (median age 39 versus 50) and better-quality transplants, measured by LKDPI (median score 7 versus 22). Their participation also enabled 280 additional transplants for incompatible pairs, including 23 recipients who were particularly hard to match.

Compatible pairs have taken part in the three largest and most efficient European KEPs—those in the UK, Spain, and the Netherlands. Based on U.S. data, Sönmez et al. [19] estimate that including compatible pairs could increase the number of transplants by up to 160%. Channeling ABOi pairs to the KEP together with compatible pairs can significantly improve transplant quality, as recently shown in a counterfactual policy analysis using a historical dataset from Padova covering 2010–2019 [20].

While individual compatible pairs may have reasons not to join the pool—such as delayed transplantation and a higher risk of error due to the greater number of people and interventions involved [18]—we conclude that permitting compatible pairs to enroll in the KEP would improve their transplant quality, benefit incompatible pairs by enabling more exchanges, and ultimately shorten the waiting list for patients who lack their own donor and therefore cannot participate in the KEP.

4. European comparisons and outlook

In this section, we illustrate the long-term effects of allowing compatible pairs to join the KEP using UK data. We then present relevant evidence from Western European KEPs and, finally, outline the expected trajectory of European KEPs, with Germany potentially joining these initiatives.

4.1. The UK KEP

The UK operates the most efficient KEP in Europe, with transplant numbers rising over the past decade to roughly 200 transplants per year. ABOi pairs are advised to register with the KEP for one year to increase the chance of finding a fully compatible and well-matched exchange donor. In addition, ABOi transplantation is permitted within exchange cycles conducted in the KEP, giving difficult-to-match recipients better opportunities [1].

As shown in Figure 2 below, despite the growing number of

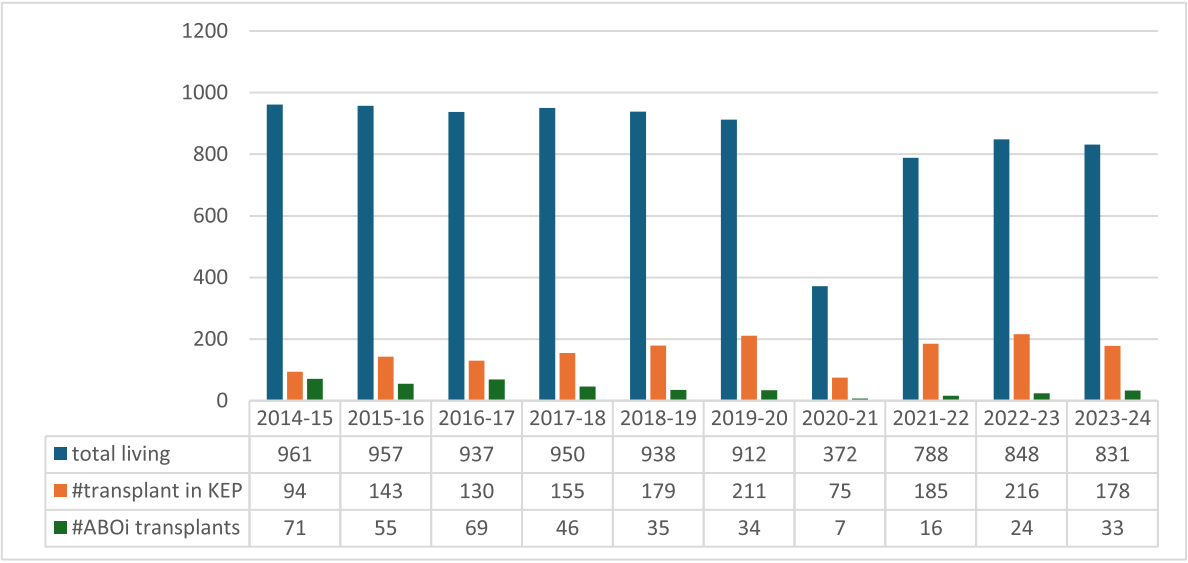

Figure 2. Total number of living donor kidney transplants in the UK (depicted in blue) in between 2014 April - 2024 March with the number of cycle and chain (depicted in orange) transplants performed in the national KEP, and the number of ABOi transplants (depicted in green). This dataset is publicly available in the NHS Blood and Transplant Activity Reports on Organ and Tissue Donation and Transplantation.

transplants, the number of ABOi transplants has been declining. We argue that the most plausible explanation is the self-reinforcing effect of the UK's recommendation policy: as more ABOi and compatible pairs register with the KEP—even if only temporarily—the number of exchange opportunities available to all participants expands. This increases the likelihood of receiving a favorable offer within a reasonable timeframe, thereby strengthening the incentive for ABOi and compatible pairs to choose KEP registration over immediate direct transplantation. Such a patient-driven mechanism can produce high-performing KEPs with large pools and abundant exchange options, ultimately delivering a substantial number of high-quality transplants. Moreover, greater participation of ABOi pairs in KEPs will likely reduce the number of direct ABOi transplants, generating cost savings for the healthcare system. In the following, we present statistical evidence from other European programs to support our argument and policy recommendation.

4.2. Western European KEPs

In Table 1, we present the number of living kidney transplants, the number of transplants conducted through the national KEP, and the number of ABOi transplants for the six most populous Western European countries in 2022 and 2023.

Table 1
Number of living transplants in the six most populous Western European countries. The numbers on the UK are for the 1 April 2022 – 31 March 2023, and 1 April 2023 – 31 March 2024 periods. The Dutch numbers are yearly averages for the years 2022 and 2023. These statistics were provided or confirmed by our contacts in the national blood and transplants organizations.

	France	Germany	Italy	Netherlands	Spain	UK
2022						
total number	514	535	336	510*	350	848
from national KEP	4	N/A	16	30*	24	216
ABOi transplants	95	119	41	39*	40	24
2023						
total number	557	608	346	510*	435	831
from national KEP	0	N/A	21	30*	16	178
ABOi transplants	77	148	29	39*	68	33

The strong performance of a KEP appears to be negatively correlated with the number of ABOi transplants. This suggests that an effective KEP can indeed reduce the need for costly desensitization procedures while improving transplant quality. This pattern may stem from the rational choices of compatible and ABOi donor–recipient pairs to enter the KEP, as they can expect to receive suitable exchange donors relatively quickly in a large pool with abundant potential cycles. However, we acknowledge that more systematic analyses and agent-based simulations using real-world datasets are required to further substantiate these claims.

4.3. All-European outlook

The development of European KEPs is anticipated to foster new international collaborations, expanding upon the existing Austrian-Czech-Israeli [21], Italian-Portuguese-Spanish [22], and Scandinavian [23] collaborations. The new German legislation may expand opportunities for KEP collaborations among Eurotransplant countries, where Eurotransplant could assume a central role in coordinating living-donor kidney sharing, similar to Scandiatransplant's efforts since 2019. A new three-year EU4Health project, EURO-KEP, launched in November 2024 under the leadership of the Spanish National Transplant Organization (ONT), aims to promote more efficient and better-connected KEPs across Europe. A jointly developed IT system, KEPsoft—initiated by the ENCKEP COST Action (2016–2021) and further advanced under the KEPSOFT COST Innovators Grant (2021–2022)—will offer a unified platform for the interconnected operation of national and international KEPs. As the most populous country in Western Europe, Germany would substantially expand the potential of a European kidney exchange program, improving the likelihood of optimal matches, especially for highly sensitized patients.

Our study is relevant in two ways for other countries, particularly within Europe. First, as Germany is expected to launch its national KEP soon, other countries can already begin planning for possible collaboration. Second, we highlight the importance of key KEP design features that can help countries evaluate their own programs. In particular, our findings indicate that allowing and encouraging compatible pairs to participate can enhance a country's living-donor transplant performance by offering higher-quality transplants for compatible pairs and creating more exchange opportunities, with fewer desensitization procedures required for incompatible pairs. Most countries update their KEP rules periodically; a very recent example (21 July 2025) is Hungary,

which removed the cycle-length limit and allowed compatible pairs to join the pool [24].

5. Conclusion

The primary focus of the draft legislation proposed by the German Federal Cabinet to amend the Transplantation Act is the introduction of a national kidney exchange program in Germany.

Drawing on European experience, we welcome the progressive elements of the draft law, including mandatory nationwide participation, the allowance of longer exchange cycles, and the inclusion of chains initiated by non-directed donors. However, we consider the exclusion of compatible pairs from the program a significant mistake that could reduce its effectiveness. We therefore recommend revising this provision.

Germany's new transplantation law has the potential to substantially improve both domestic transplant activity and cross-border kidney exchange programs across Europe. To fully realize this potential, we propose that the legislation align with European best practices by allowing compatible pairs to register in the program.

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CRediT authorship contribution statement

Péter Biró: Writing – review & editing, Writing – original draft, Methodology, Conceptualization. **Klemens Budde:** Writing – review & editing. **Lisa Burnapp:** Writing – review & editing. **Ágnes Cseh:** Writing – review & editing, Writing – original draft. **Christine Kurschat:** Writing – review & editing. **David Manlove:** Writing – review & editing, Conceptualization. **Axel Ockenfels:** Writing – review & editing, Conceptualization.

Declaration of competing interest

D.M. is a scientific adviser and non-executive director of KEPsoft Collaborative CIC, a not-for-profit provider of software for kidney exchange programs. The remaining authors declare no conflict of interest.

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