

Bringing a Systems Approach to Living Donor Kidney Transplantation



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Introduction: Living donor kidney transplantation (LDKT) is the best treatment option for patients with kidney failure. Efforts to increase LDKT have focused on microlevel interventions and the need for systems thinking has been highlighted. We aimed to identify and compare health system-level attributes and processes that are facilitators and barriers to LDKT.

Methods: We conducted a qualitative comparative case study analysis of 3 Canadian provincial health care systems with variable LDKT performance (Quebec: low, Ontario: moderate-high, British Columbia: high). Data collection entailed semistructured interviews ($n = 91$), document review ($n = 97$) and focus groups ($n = 5$ with 40 participants), analyzed using inductive thematic analysis.

Results: Our findings showed a strong relationship between the degree of centralized coordination between governing organizations and the capacity to deliver LDKT as follows. (i) macro-level coordination between governing organizations in British Columbia and Ontario increased capacities, whereas Québec was seen as decentralized with little formal coordination; (ii) a higher degree of centralized coordination facilitated more effective resource deployment in the form of human resources and initiatives in British Columbia and Ontario, whereas in Québec resource deployment relied on hospital budgets leading to competition for resources and reduced capacity of initiatives; (iii) informal resource sharing through strong communities of practice and local champions facilitated LDKT in Ontario and British Columbia and was limited in Québec.

Conclusion: Our findings suggest that interventions that account for full-system function, particularly macro-level coordination between governing organizations can improve LDKT delivery. Findings may be used to guide structured organizational change toward increasing LDKT and mitigating the global burden of kidney failure.

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KEYWORDS: barriers; facilitators; kidney transplantation; systems

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Kidney failure is a global public health issue. Kidney transplantation, in particular, LDKT significantly

improves the survival and well-being of people with kidney failure and is cost-effective for health care systems.^{1–6} In some countries, almost all kidney transplantations involve organs from living donors.⁷ Increasing LDKT globally has the potential to mitigate the mortality burden attributed to kidney failure. However, global living kidney donation rates have been <5 living kidney donors per million population from 2008 to 2023.^{7,8} In addition, the absolute number of living donor

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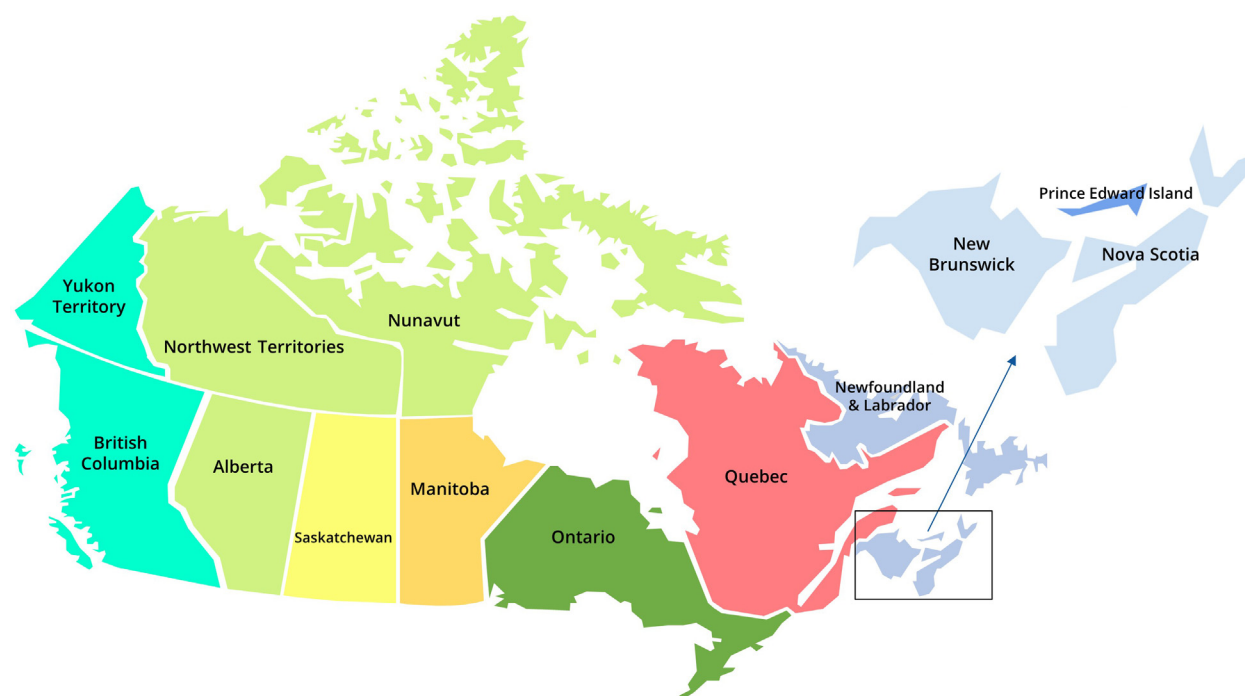


Figure 1. A map of Canada indicating the 10 provinces and 3 territories. There are the 7 transplant jurisdictions and the areas they cover are color-coded. Of note, 75% of Canada's population and >70% of the people with end-stage renal disease reside in the 3 provinces of Quebec, Ontario, and British Columbia; the 3 health systems we analyzed.

kidney transplants being performed in many countries has minimally increased over the past 2 decades.^{5,6,9-13}

Until recently, most efforts to increase LDKT focused on implementing patient-level interventions. A systematic review reported that these interventions are modestly effective.¹⁴ In addition, examined studies were at a high risk of selection bias because they restricted participation by factors such as the ability to speak English and use a computer. Focusing on patient-level interventions only may contribute to disparities in access to LDKT because it favors those who have the social and financial means to learn the process and pursue donors.¹⁵⁻¹⁸ In addition, individual-level focus misses important organizational and environmental levels of practice that are essential components of a health system.^{19,20} Emerging work has emphasized that addressing system-level barriers and implementing broad system-level interventions are essential to success in transplantation.²¹⁻²⁵ A comprehensive systems approach can help address care delivery challenges and achieve a patient-centered and high-performing health care system.^{19,26-31} A recent commentary suggests that issues in transplantation will only be solved through systems thinking.³²

We conducted a qualitative comparative case study analysis of 3 Canadian provincial health care systems with variable LDKT performance. Almost 30,000 patients are currently receiving dialysis in Canada, and annually between 1600 and 1750 kidney

transplantations are performed across 7 transplant jurisdictions (Figure 1).¹³ We included the 3 most populous Canadian provinces which include Québec, Ontario, and British Columbia that together conduct approximately 75% of the total kidney transplants in the country. In 2022 for instance, a total of 1741 transplants were conducted, of which 18.9% were done in Quebec, 39.9% in Ontario, and 16.3% in British Columbia.

Québec, Ontario, and British Columbia were also specifically chosen for our study because they are widely considered to be low, moderate-high, and high performing health care systems with respect to LDKT, respectively.^{6,10,11} Quantitatively this can be demonstrated by national data that reports that the proportion of LDKT to all transplants performed (deceased and living donor) are generally <15%, 30% to 40%, and >50% in these provinces, respectively. In addition, the national living donor rates per million population is 14 to 15, and the individual rates in these 3 provinces are below, at, and above this average, respectively.^{6,10,11} Seventy-five percent of Canada's population, >70% of the people with end-stage renal disease reside in these provinces, and the prevalence of end-stage renal disease is proportionate to the populations indicating that patient demographics do not explain this variability in LDKT performance.³³

Canada provides universal health care that is federally mandated but administered and regulated by the

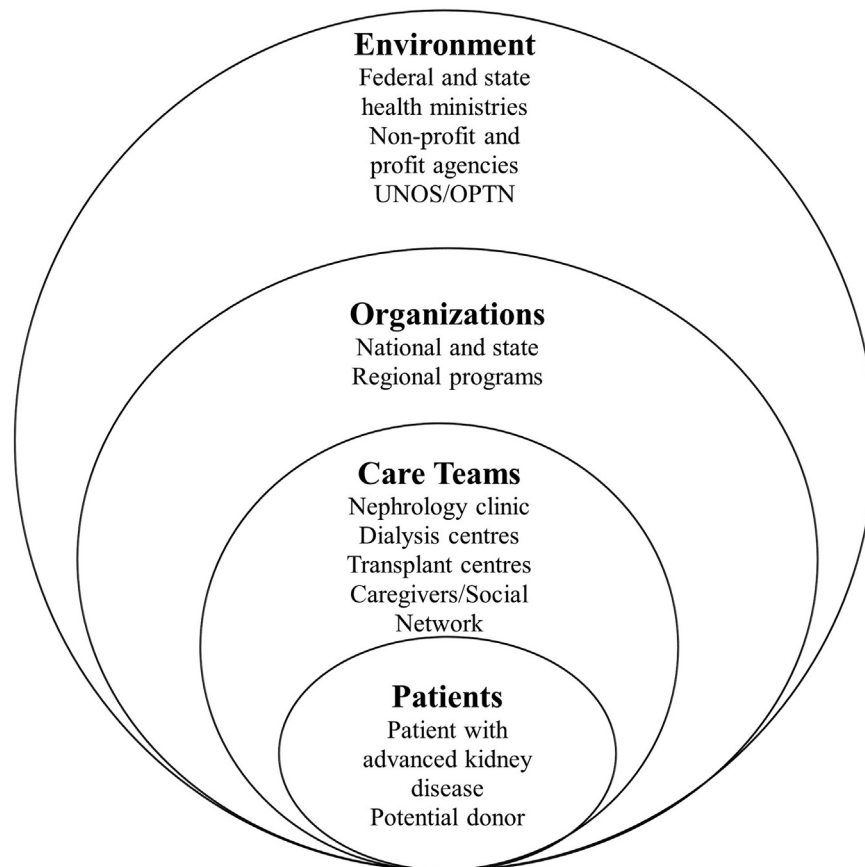


Figure 2. Envisioning the health system that delivers living donor kidney transplantation to patients as a complex adaptive system. We mapped the health care system that delivers LDKT as being composed of macro-, meso-, and micro- levels of practice that are interconnected, dynamic, and nested, with the patient at its core. These levels include organizations, service providers, recipients, and donors, representing the human and nonhuman agents that are implicated in the delivery of LDKT and thus form the elements for our analysis. This framework was proposed by the National Academy of Engineering [United States] and Institute of Medicine [United States] Committee on Engineering and the Health Care System [Reference ¹⁹]. LDKT, living donor kidney transplantation.

provinces leading to differences in the organization and delivery of services, such as LDKT.^{6,10,11} Thus, its suite of multidirectional influences, within and across different but comparable systems, provides an ideal setting to conduct a system-wide investigation and understand differences leading to variable performance. Our specific aim was to identify the broad system-level attributes and processes of a high-performing health system that are facilitators of LDKT and compare them with other lower performing health care systems.

METHODS

The study was approved by the research ethics board at the McGill University Health Centre.

A qualitative comparative case study is a widely used methodology to identify key initiatives or events that led to improved performance along with barriers and facilitators to progress.^{34–38} A detailed protocol has been previously published.³⁹ Our methods are briefly summarized below.

Theoretical Framework

We approached a health system that delivers LDKT as a complex adaptive system.^{20,39} This theory proposes that a system is a dynamic network of agents acting in parallel, constantly reacting to what the other agents are doing, which in turn influences behavior and the network as a whole.^{40,41} This approach has been used increasingly as an analysis and research development tool in health care, with favorable results.^{42–44} We then operationalized a framework developed by the National Academy of Engineering (US) and Institute of Medicine (US) Committee on Engineering and the Health Care System to visualize Canada's LDKT health system as a complex adaptive system divided into 4 nested and interconnected levels with the patient at its core (Figure 2).¹⁹

Step 1: Individual Case Studies

We first conducted independent case studies of each provincial health system with the aim of understanding how certain attributes and processes of a health system are linked to the provision of LDKT in each province. A

Table 1. Participants categorized by the element within the health system

Participant category	Interviews (<i>n</i> = 91)	Focus groups (<i>n</i> = 40)
Ministry of Health representatives	1	-
Organ donation organization representatives	4	1
Renal program representatives	4	1
Health care (and other) professionals at transplant centers	40	10
Health care professionals at nephrology clinics or dialysis centers	35	6
Living donor kidney transplant recipients	3	9
Living donors	3	13
Other (NGO representative)	1	-

NGO, nongovernmental organization.

case study is an in-depth, noninterventional examination of a single case over time to investigate a contemporary phenomenon in its natural context.⁴⁵⁻⁴⁷ Our case studies were inductive and explanatory.^{22,23} Data collection entailed semistructured interviews with participants from different levels of the health system who were recruited using purposive and snowball sampling (AH) (Table 1). Document review served as complementary data collection and as a means of triangulation with interview data.⁴⁸ Documents for review were identified in consultation with our collaborators in each province, during interviews, and using web searches of governmental, organ donation organizations, renal programs, and hospital platforms. Documents were included if they were a policy, guideline, resource, program outline, presentation, announcement, or report pertaining to LDKT. Searches were conducted in both English and French. Data gathering continued until data saturation was reached within particular categories of stakeholders sampled.⁴⁹ Our analysis of the documents entailed appraising and synthesizing the data contained in the documents, followed by clustering the documents thematically.⁴⁸ Interview data were analyzed using inductive thematic analysis using NVivo (version 12, 2018 QSR International) by 2 team members (AH and KL), and the analysis was reviewed and discussed by all coinvestigators.⁵⁰

Step 2: Focus Groups

We then conducted 5 focus groups, with the purpose of gleaning opinions on findings from our 3 case studies. We recruited previous interview participants, as well as stakeholders from other Canadian provinces (Table 1). We sought to understand whether our findings resonated with the opinions and experiences of our participants, and to what extent the themes we found were seen in provinces outside of the 3 provinces examined. Two focus groups were held with

professionals, including decision-makers from Organ Donation Organizations and Renal Programs, as well as health care professionals (HCPs) from transplant centers and nephrology clinics (*n* = 18). Three focus groups were held with living donors and LDKT recipients (*n* = 22). Data were analyzed inductively and thematically.

Step 3: Comparative Analysis

Lastly, we conducted a comparative case analysis; comparison and synthesis of the similarities, differences and patterns across multiple cases that share a common goal.^{51,52} First, 2 team members (AH and KL) organized codebooks from each province into a spreadsheet with preliminary identified themes, to enable comparison across cases. Then, 3 more team members (SS, MCF, and PN) reviewed these codes independently. Finally, all 5 members (SS, MCF, PN, AH, and KL) collaboratively identified distinct attributes and processes through individual and collective analysis, lengthy discussions, and comparisons.

RESULTS

A total of 91 interviews (British Columbia = 22; Québec = 32; Ontario = 37) and 5 focus groups (*n* = 40) were conducted, and 97 documents were reviewed (Tables 1 and 2). Overall, our findings showed a strong relationship between the degree of centralized coordination between governing provincial organizations and the capacity of the province to deliver LDKT. We discuss themes regarding LDKT facilitation that were linked by our participants to these varying degrees of interorganizational coordination. Themes under each category are organized and presented separately for clarity but were largely found to be interdependent.

System Resilience Through Macro-Level Coordination

There were notable differences in the degree of cohesion at a structural level between governing organizations involved in LDKT (Figure 3). Participants in British Columbia and Ontario described strong, centralized leadership for renal care, which was seen to provide reliable modes of coordination between organizations. These, in turn, were linked to positive effects for LDKT promotion and facilitation. Both provinces

Table 2. Documents reviewed and their characteristic

Document theme	Number of documents reviewed		
	British Columbia	Ontario	Quebec
LDKT governance	4	9	11
Health care professional resources	4	2	4
Patient and donor resources	33	18	12
Total (<i>N</i> = 97)	41	29	27

LDKT, living donor kidney transplantation.

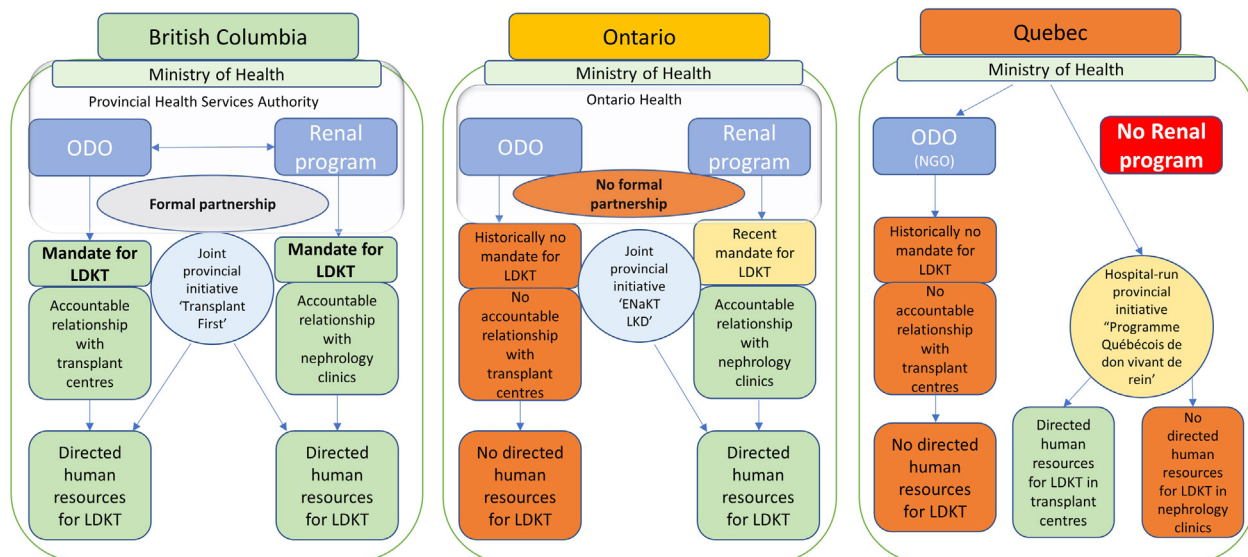


Figure 3. Partnership and coordination between organizations to support LDKT in the 3 health systems. Variable degrees of coordination and partnerships between macro-level organizations in 3 Canadian provincial health care systems were linked to living donor kidney transplantation facilitation in our comparative case study analysis (orange indicates a negative connotation) ODO, organ donation organization.

have macro-level agencies (a Renal Program and an Organ Donation Organization) with provincial oversight and provide leadership for nephrology clinics throughout the province. In British Columbia, BC Renal Agency and BC Transplant, are closely integrated and have a joint mandate for LDKT facilitation. In Ontario, the Ontario Renal Network has a recent mandate for LDKT facilitation and is also linked to Ontario's Organ Donation Organization, although to a lesser extent. The centralization of leadership for renal care, and strong organizational coordination between governing bodies, particularly in British Columbia, have substantial effects on the capacities of all organizations involved in LDKT facilitation.

"I think that's a huge strength in British Columbia. Is the communication with the kidney care clinics and the provincial renal agency as well as BC Transplant. Like, we are lucky that it's one big program here, and that the communication is the same and that we work and have the same messaging across centers and sites". (Transplant HCP, BC)

By contrast, there is no macro-level organization with provincial oversight to support LDKT in Québec (Figure 3). Québec's Organ Donation Organization does not have a stated mandate to facilitate or promote LDKT. There is no renal agency, and LDKT facilitation remains at meso-levels of practice, which was seen to diminish opportunities for early intervention to promote LDKT in nephrology clinics.

"I think other provinces have renal protective agencies – like the BC Renal Agency and things like that, advocate for them at the provincial level. We

don't have that. So, I think that's a problem in Quebec. Like renal disease and transplantation – there's nobody really strongly advocating for it. There's nobody that's out there saying, 'we need resources here, we need resources there – you need to do this.' " (Nephrology HCP, QC)

Moreover, in other provinces, HCPs recognized the value of macro-level organizations to provide resilient structures of support and linked the absence of centralized coordination with limited ability to realize and improve LDKT facilitation.

"British Columbia and Ontario, they have a very well-structured system with the BC Renal Agency and BC Transplant, and I really strongly believe that is primarily one of the main reasons why living donation has excelled in that province. In Saskatchewan we don't have that structure... and there's very little collaboration and very little discussion and room for – or very little discussion on how things can improve... I think that it's becoming recognized that without some sort of a provincial structure of a renal agency, we're really not going to have living donation become a key option for patients." (Transplant HCP, SK)

Resource Deployment for Adaptive Capacity Directed Human Resources

The challenges of intraorganizational competition for resources were noted by many participants from all provinces as a barrier to facilitating LDKT. However, this competition was seen to be partially mitigated by effective resource deployment in British Columbia and

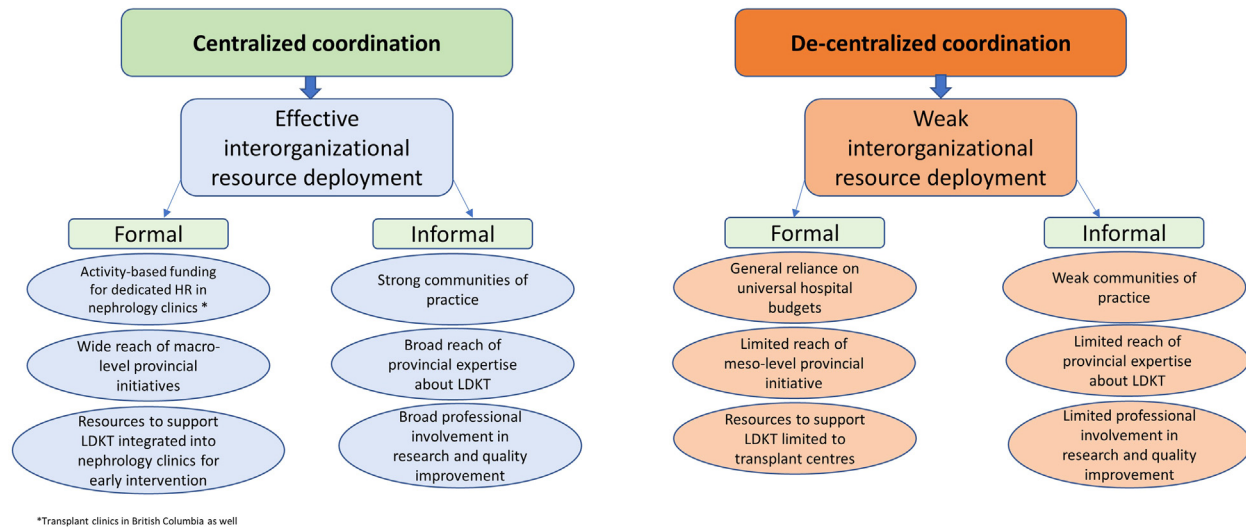


Figure 4. Relationship between degree of coordination and interorganizational resource deployment.

Ontario. The degree of centralized coordination of renal care governance was linked, by participants, to the efficacy of resource deployment to support and facilitate LDKT by allowing flexibility according to need and adaptation to changing circumstances (Figure 4).

Both British Columbia and Ontario employ an activity (or volume)-based funding model to deploy dedicated human resources to support LDKT, although to different extents. In British Columbia, resource deployment was seen to be the most extensive and well-integrated, including the following: (i) the deployment of directed human resources to support LDKT in transplant centers, (ii) the deployment of transplant coordinators in nephrology clinics, and (iii) securing the involvement of social workers in nephrology clinics to provide psychosocial support for patients to pursue LDKT.

“...Getting through BC Transplant, the funding model to hire the staff to support the program – I think those were the key reasons for success”.
(Leader in governance, BC)

Having psychosocial support utilized in this way was noted by many participants to increase the organizational capacity of nephrology clinics to promote and facilitate LDKT. In Ontario, the Renal Program uses a volume-based funding model to deploy transplant coordinators in nephrology clinics, though this model is not used in transplant centers, where resources are largely reliant on hospital budgets.

In Québec, there have historically been no consistent dedicated human resources to support LDKT at transplant centers or in nephrology clinics. Some participants identified a hospital-run initiative funded by the provincial Ministry of Health since 2018 that has deployed 3 personnel in each transplant

center (a living donor coordinator, social worker, and administrative assistant). However, there remains no directed resource deployment to support LDKT in nephrology clinics. Resource acquisition in nephrology clinics is reliant on hospital budgets, making it subject to intraorganizational competition. This was described by many participants as limiting the capacity of organizations to support LDKT (Figure 3).

“We are a relatively small community hospital. It’s definitely under – we don’t have the means. The hospital is very poor. No, and there is really – like at the leadership level in the hospital, other problems have bigger magnitude than kidney donation, kidney transplantation. So absolutely no support. Absolutely no initiatives.”(Nephrology HCP, QC)

Donor and recipient participants identified psychosocial support, in particular, to be an important resource for LDKT facilitation.

“You should have someone to at least talk to, even if it’s a couple times. Just to, like, mental check in, like, how are you doing? How (are) things going? Because it’s a lot to, like, you know, prepare to put yourself through”. (LDKT donor, NS)

Provincial Initiatives

Participants also linked provincial interorganizational coordination to the relative success of provincial initiatives targeted to improve LDKT facilitation (Figures 3 and 4). All 3 provinces have implemented targeted initiatives to improve access to and facilitation of LDKT.

In British Columbia, “Transplant First” was implemented and supported by a cohesive strategic partnership between the Renal Program and the Organ

Donation Organization. The initiative was described by many participants as having been effectively integrated with nephrology clinics across the province.

“They recognized that and undertook a project [Transplant First] with B.C. renal program and B.C. Transplant, working collaboratively together to basically provide the whole province – like they’ve done a whole project with the whole province”.
(Nephrology HCP, BC)

In Ontario, the “EnAKT LKD” initiative was described by many as having increased the organizational capacity of nephrology clinics to facilitate LDKT (at the time of data collection, only half of the 26 nephrology clinics had administered the intervention). Some participants highlighted capacity-building across the provincial network that had been enabled by the oversight of the renal program.

“There’s been a lot of – the Ontario Renal Network just recently has put in a lot of work into establishing the whole living donor piece, putting in resources, educational materials, working with different teams. There is a lot of effort and work.”
(Nephrology HCP, ON)

In Québec, in 2018, a program called the Quebec Living Kidney Donor Program was established with the mandate to improve LDKT rates. This program was described as a hospital-based initiative, with resources deployed and knowledge of the program remaining mostly limited to transplant centers. It was seen to lack the capacity and reach of a macro-level program.

“[The Quebec Living Kidney Donor program] doesn’t have it; doesn’t have the weight of a national program, right? It’s a [hospital]-based program. It’s administered by [hospital] and they get to decide the direction of things... It doesn’t have the weight of a national agency.” (Leader in governance, QC)

Collaborative Capacity for Informal Resource Sharing

Macro-level capacity was seen to facilitate collaboration across the system. Participants valued and made links between interorganizational networks and less formal forms of resource-sharing that influenced their capacity to facilitate LDKT (Figure 4).

Communities of Practice

In Ontario and British Columbia, the leadership and provincial oversight of the Organ Donation Organizations and Renal Programs were linked to strong communities of practice, as well as collaborative research projects and quality-improvement initiatives, with multiorganizational and multidisciplinary

representation. Communities of practice were sustained through regular meetings of working groups and committees, which were often organized in partnership with governing organizations, and involved multiorganizational representation. These meetings were described as enabling cross-pollination of ideas and important opportunities for interorganizational learning. Importantly, these meetings, groups and committees also served as opportunities to foster familiarity between HCPs, across organizations and disciplines.

Cultivating familiar interpersonal relationships between professional stakeholders involved in LDKT facilitation was consistently described by participants as an important way to generate opportunities for *ad hoc* support, guidance, and sharing expertise. This was seen as particularly beneficial when LDKT facilitation spans multiple care teams, often operating across large geographic distances, and when expertise regarding LDKT was often limited in nephrology teams.

“We’ve actually made a specific steering committee that’s joint between BC Transplant in BC Renal. And, you know, I’m one of the cochairs and one of the other cochairs is a transplant nephrologist... So, we’ve made it very specifically a partnership between the 2 that’s not directly under either one of them. So – and again, I think just the ability to do that, the ability just to strike up a whole big body of work and working groups and steering committees and that type of stuff as a complete partnership between the 2 – I think it speaks to the fact that I think we have a very, very excellent relationship.”
(Leader in Governance, BC)

“It’s been nice getting matched with other programs. Like recently – like we were matched with Ottawa. So, it just kind of shooting back and forth ideas. Or what do you guys do for this? Or what’s the process like at your center? So, yeah, like we are in communication with other programs. Or if we want like an opinion about something... And I feel like everybody is happy to share things.”
(Transplant HCP, ON)

“...Certainly, you know, I feel that putting a face to a name, for example, or putting the word out there or just discussing process helps them think, you know, OK, I can call [name] anytime, for example, and ask a question. So, it really helps, you know, it helps build both our relationship. And we’ve also had other events where, you know, 2 years ago we celebrated 50 years of transplantation at [hospital]. So, we had a gala, and we invited all the transplant center staff, and just had an evening of recognition.

It really helped, you know, improve relationships. Also, you know, I feel like they're more comfortable calling us just to sort of go through some questions." (Transplant HCP, ON)

By contrast, our data suggested limited communities of practice in Québec. Few participants interviewed outside of transplant centers reported being involved in research activities, working groups, committees, or initiatives that address LDKT. A lack of interpersonal familiarity between HCPs and between organizations was described as limiting opportunities for effective interorganizational coordination and support to facilitate LDKT and cross-system learning.

"...It's like an unbelievably frustrating process. And we never get – anything to do with live donation and we never get any feedback... we have zero communication with that person. I can't even tell you who it is. I don't even know their name." (Nephrology HCP, QC)

Champions

Across all 3 provinces, local champions for LDKT were noted by many participants as a valuable source of informal resource-sharing in transplant centers and nephrology clinics. HCPs who championed LDKT were described as increasing the capacity of other HCPs and the organization overall to facilitate LDKT. However, it was notable that in British Columbia and Ontario, local champions were supported by centralized renal care organizations, whereas in Québec, the championship for LDKT was delivered in a more *ad hoc* manner in the absence of macro-level leadership.

Optimizing Interorganizational Coordination and Learning

Although notable differences in the provincial capacity to facilitate LDKT are linked to the strength of inter-organizational relationships, our data showed that no jurisdiction fully optimized interorganizational coordination.

Competition With Other Treatments

Participants from all 3 provinces described common themes that hindered the effective facilitation of LDKT. Although directed human resources to support LDKT was a strongly described facilitator, broader organizational mandates and stretched organizational capacities in other areas of care could limit the ability of these resources to be effective. This was notable in nephrology clinics, where HCPs felt that LDKT expertise, promotion, and facilitation, were limited by organizational mandates to facilitate other treatments for kidney failure: notably, dialysis.

"I can tell you they don't talk about living donor kidney transplant. They are there – their function is to try to get people to do home dialysis." (Transplant HCP, ON)

Coordination Among Meso-Level Organizations

Furthermore, although strong centralized coordination enabled certain features that aided interorganizational coordination, participants from all 3 provinces often described weak relationships between meso-level organizations, namely, transplant centers and nephrology clinics. This was seen by many to delay effective LDKT delivery, particularly with regard to evaluations of the potential transplant recipient.

"When we have an identified live donor, it's extremely rare that the whole process is done in a rapid enough fashion [such] that they're able to do it before the patient needs dialysis. And so, obviously, from my point of view, I find it discouraging. And sometimes it may make me not push for live donation as much as I would like..." (Nephrology HCP, QC)

Concurrently, in transplant centers, many participants noted that donor evaluations were lengthy and poorly coordinated, and this was often linked to limited intraorganizational access to the testing facilities needed to perform the evaluations.

"I think there's a frustration sometimes in how long the process can take when somebody is really eager and gung ho. And that's just systemic delays... The test results from the crossmatch take sometimes 6 days, usually 6 to 8 weeks for the results to come in. And that's really long. Yeah. And that's typically the final phase of testing. So, if somebody is otherwise all good to go, they may have to wait another 2 months just to find out if they can actually donate directly or not". (Transplant HCP, BC)

When donor evaluations were perceived as lengthy or poorly-coordinated, it led to frustration for both donors and recipients.

"I was frequently quite frustrated. It took me 8 months to get approved. And I felt like there was this list of tests that was really ad hoc and not well-planned or strategic". (LDKT donor, ON)

Financial Support

Many participants from all provinces held the opinion that reimbursement schemes for donors, as well as financial support for recipients, were inadequate and poorly integrated. Limited aid, as well as rigid and piecemeal management of resources for both donors and recipients, particularly in the case of the Kidney Paired Donation program, were considered to detract

from the value of LDKT and were described by many participants as a deterrent to pursuing LDKT as a treatment option. Moreover, both donor and recipients focus group participants described inadequate and poorly managed resourcing as a significant source of stress during their experiences of LDKT.

"...In New Brunswick, antirejection postsurgery medication is not covered by Medicare. So that is expected to come out of the pocket of the person. So, I was in grad school, paying \$400 plus a month just for antirejection medication that was not covered".
(LDKT recipient, NB)

DISCUSSION

Adopting a research approach that centralizes systems thinking, our findings from key stakeholders in LDKT delivery suggested a tight relationship between the degree of coordination between the organizations involved in LDKT delivery, and the capacity of the health care system to facilitate LDKT. Particularly in British Columbia, and to a lesser extent in Ontario, our data suggest that high levels of organizational capacity and strong strategic partnerships between governing bodies that have provincial oversight were linked to effective resource deployment and resource-sharing throughout the province. By contrast, with less centralized leadership and accountable relationships between organizations, we found that Québec has struggled to effectively coordinate LDKT. However, our findings also suggest that no jurisdiction fully optimized interorganizational relationships. Common issues related to weak network competence and siloed activity, which were seen to some extent in all 3 provinces. Overall, in a real-world setting, our data indicate that understanding and addressing contingent, interorganizational practices, and particularly macro-level structuring of a health system can facilitate the provision of LDKT and its more effective and efficient delivery as a therapy to patients.

Recent reports of single health care systems in Europe have reported similar facilitators to transplantation, such as strong governing structures, clear leadership, well-established professional roles, and centralization and coordination of activities^{53,54} Two other initiatives to implement a learning health systems approach in transplantation also reported the importance of system-wide approaches.^{31,55} Beyond this, a systems approach toward improving the delivery of transplantation to patients has rarely been adopted. This is surprising and a missed opportunity in many ways, given the network of elements involved at different levels, such as patients, policymakers, HCPs, procurement organizations, and national networks. An

integrated and coordinated health care system can inform individual risk prediction, optimize care delivery practices, and help align patient and caregiver expectations and bridge practice gaps.⁵⁶ With this understanding, there is significant scope to increase access to LDKT and decrease the global mortality and burden associated with kidney failure.

Since the 1990s, organizational research in health care has demonstrated that collaboration between organizations is key to innovation and learning,⁵⁷ and achieving optimal outcomes is fundamentally thought to be about improving coordination.⁵⁸ Minimizing fragmentation through systemic care coordination, combined with the systematic delivery of evidence-based care, is fundamental to improving health care delivery.⁵⁹ Our qualitative analysis shows that in British Columbia and to some extent in Ontario, macro-capacity for coordination has enabled a helpful balance between shared resources and lessons, and local initiatives to suit local circumstances. Overall, our findings support growing evidence that indicates the importance of coordinative and collaborative capacity for optimal LDKT service performance.

The strength of our study is that our qualitative methodology enabled us to capture less formal aspects of organizational relationships, such as interorganizational learning and communities of practice, which were found to inform the capacity of a system to facilitate LDKT. We acknowledge the following limitations. Although we aimed for a comprehensive representation of stakeholders, it is possible that some perspectives may have been missed and that our document review was not exhaustive. There was a high degree of comparability between the cases we selected. However, broader structural, economic, and cultural differences may have contributed to our findings in ways that our data collection was unable to capture. The applicability of our findings to other countries with different health systems await testing in different contexts, although, they may provide a roadmap to more structured organizational change in different health systems. This is of significance to the global nephrology community given the rising burden of kidney failure and limited access to other renal replacement therapies in some regions.^{7,60}

Our findings have implications for the global nephrology community, particularly in lower- and middle-income countries where LKDs are the only or main way to pursue kidney transplantation. The Global Observatory on Donation and Transplantation has recorded 328,066 transplants from LKDs between 2013 and 2022 and 26.4% of the 167 countries that participated in the 2023 iteration of the Global Kidney Health Atlas reported that all transplants in their country were

from LKDs.⁵³ We report that even in a high-income country such as Canada, with universal health care where the cost and insurance-related concerns are generally not significant barriers to seeking care, there are important impediments to LKD care and opportunities to improve care processes.

Our work supports the notion that systems thinking is needed to advance the field of kidney transplantation.³² We have identified 3 system attributes that facilitate the delivery of LDKT in high-performing health systems, and the lack of these attributes emerged as barriers to LDKT in another lower-performing health system. These can serve as a guide for those interested in advancing living kidney donation in their programs or regions. Our next steps entail identifying policy approaches on how to transfer, translate, and adapt the knowledge generated to the health system in Quebec and improve rates of LDKT in the second-largest province of Canada.

In conclusion, our findings suggest that macro-level coordination between governing provincial organizations is linked to effective formal and informal resource deployment, resource-sharing, and facilitating LDKT. Our systems and qualitative research approach have implications for the field of nephrology and transplantation as they acknowledge the interconnections and complexity that go beyond the call for individual-level change and provide a roadmap to more structured organizational change.

DISCLOSURE

SS has received a grant from Amgen Canada to increase living donor kidney transplantation. LG has received honoraria or consultancy fees from GSK Canada, Paladin Labs Inc., Novartis Canada Inc., MERCK, and AstraZeneca Canada Inc. SS, M-CF, PC, and LG are members of the Organ and Tissue Donation and Transplantation (OTDT) Advisory Committees of the Canadian Blood Services. MRP is a medical advisor for the Canadian Blood Services; and PC is the medical director of Transplant Quebec. All the other authors declared no competing interests.

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DATA AVAILABILITY STATEMENT

The data sets generated and analyzed during the current study are not publicly available, because informed consent to share transcribed data for secondary use beyond this research was not obtained from participants.

AUTHOR CONTRIBUTIONS

SS conceived, designed, and conceptualized the study and was involved in the overall conduct of this study. PN, AH, KL, and M-CF advised on the methodology, design, and theoretical frameworks. IM, GK, LG, MC, DL, MP, and PC helped facilitate data collection. AH is the research coordinator and conducted interviews. AH and KL conducted focus groups and data analysis. AH and SS wrote the first draft of the manuscript, and the remaining authors revised the manuscript and made substantive intellectual contributions. All authors have approved the final manuscript and agree to be accountable for all aspects of this work.

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