Impact of having potential living donors on ethnic/racial disparities in access to kidney transplantation

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Abstract
Racial/ethnic disparities persist in patients' access to living donor kidney transplantation (LDKT). This study assessed the impact of having available potential living donors (PLDs) on candidates' receipt of a kidney transplant (KT) and LDKT at two KT programs. Using data from our clinical trial of waitlisted candidates (January 1, 2014–December 31, 2019), we evaluated Hispanic and Non-Hispanic White (NHW) KT candidates' number of PLDs. Multivariable logistic regression assessed the impact of PLDs on transplantation (KT vs. no KT; for KT recipients, LDKT vs. deceased donor KT). A total of 847 candidates were included, identifying as Hispanic (45.8%) or NHW (54.2%). For Site A, both Hispanic (adjusted OR = 2.26 [95% CI 1.13–4.53]) and NHW (OR = 2.42 [1.10–5.33]) candidates with PLDs completing the questionnaire were more likely to receive a KT. For Site B, candidates with PLDs were not significantly more likely to receive KT. Among KT recipients at both sites, Hispanic (Site A: OR = 21.22 [2.44–184.88]; Site B: OR = 25.54 [7.52–101.54]), and NHW (Site A: OR = 37.70 [6.59–215.67]; Site B: OR = 15.18 [5.64–40.85]) recipients with PLD(s) were significantly more likely to receive a LDKT. Our findings suggest that PLDs increased candidates' likelihood of KT receipt, particularly LDKT. Transplant programs should help candidates identify PLDs early in transplant evaluation.

KEYWORDS
health disparities, kidney failure, Latinx

1 | INTRODUCTION

Living donor kidney transplantation (LDKT) is the optimal treatment for patients with kidney failure because it confers greater patient and graft survival, shorter waiting time, and better quality of life than deceased donor kidney transplantation (DDKT). However, such patients encounter myriad barriers to receiving LDKT. Moreover, Hispanic/Latinx (henceforth “Hispanic”) patients with kidney failure receive disproportionately fewer LDKTs than non-Hispanic White patients (NHW). Of all waitlisted Hispanic patients, only 5.2% received a LDKT, compared to 11.4% of waitlisted NHW patients in 2021.

Patient, potential living donor (PLD), healthcare provider, and healthcare and other systemic factors contribute to ethnic

Abbreviations: DDKT, deceased donor kidney transplantation; KT, kidney transplantation; LDKT, living donor kidney transplantation; NHW, non-Hispanic White; OPTN, Organ Procurement and Transplant Network; PLD, potential living donor.

Registration: ClinicalTrials.gov registered (retrospectively) on 9-7-17 (NCT03276390).

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disparities in and general barriers to LDKT. Patient-related factors for Hispanics pertain to lack of LDKT knowledge, cultural/religious concerns, financial challenges, and distrust of healthcare providers. PLD factors relate to knowledge of transplantation, eligibility, evaluation time, and expense. Provider-related factors relate to discordance in ethnic/racial background between providers and patients, attitudes, and Spanish language competency. System-related factors involve processes of care (e.g., interpreter availability, educational resources, accountability).

An important patient factor that has received relatively little attention pertains to their PLDs. Because having a larger social network and number of PLDs is associated with candidates' increased access to LDKT, some have posited that having fewer PLDs may help explain racial/ethnic disparities in LDKT. However, studies report that transplant candidates' network size does not vary between African American and NHW candidates and dialysis patients, rather, level of instrumental support provided by network members affects African American candidates' request for their network members to become LDs. Yet no research has examined the number of available PLDs and number of PLDs is associated with candidates' increased access to LDKT through a complex culturally competent transplant program involving outreach, education, and bicultural/bilingual staff. The study was conducted at two transplant centers in the South (Site A) and Southwest (Site B) United States, which served large Hispanic populations and had large volumes of LD KT s, as previously described. The present paper focuses on waitlisted kidney transplant candidates, who had initiated transplant evaluation between January 1, 2014 and December 31, 2019 to provide all patients comparable time to find a PLD and receive a transplant. Institutional Review Boards approved the study (Northwestern University: STU00201331, Mayo Clinic: #16–002328, Baylor: #016–115). The study was registered on 9–7–17 in ClinicalTrials.gov (NCT03276390).

2 | METHODS

2.1 | Setting and design

This paper presents a data subset derived from a larger study designed to increase LDKT through a complex culturally competent transplant program involving outreach, education, and bicultural/bilingual staff. The study was conducted at two transplant centers in the South (Site A) and Southwest (Site B) United States, which served large Hispanic populations and had large volumes of LDKTs, as previously described. The present paper focuses on waitlisted kidney transplant candidates, who had initiated transplant evaluation between January 1, 2014 and December 31, 2019 to provide all patients comparable time to find a PLD and receive a transplant. Institutional Review Boards approved the study (Northwestern University: STU00201331, Mayo Clinic: #16–002328, Baylor: #016–115). The study was registered on 9–7–17 in ClinicalTrials.gov (NCT03276390).

2.2 | Data sources

Patient-level data were obtained from medical chart review and were collected using Research Electronic Data Capture (REDCap), a secure, web-based application. Data collected included: candidate demographics (i.e., age, gender, insurance), clinical characteristics that affect access to kidney transplantation and LDKT (i.e., kidney disease etiology, body mass index, comorbidities), date of transplant waitlisting and specification of waitlisting, date and type of kidney transplantation (LDKT/DDKT), the number of PLDs who completed the medical health questionnaire (Breeze™), and linked number of PLDs who initiated donor evaluation. Medical records of PLDs linked to candidates were also reviewed to assess the relationship between PLDs and candidates. The PLDs' verbal expression of interest was reported by transplant candidates and/or their companions when meeting with the transplant surgeon during patient evaluation, as described elsewhere.

2.3 | Participants and recruitment

For this article, eligible participants included adult (age 18+ years) self-identified (recruited prospectively 2017–2019) or medical record-identified (recruited retrospectively 2014–2016) Hispanic and NHW patients who had initiated transplant evaluation for a kidney transplant (KT) and had been cleared to be waitlisted between 1/1/2014–12/31/2019. Written informed consent was prospectively obtained; the Institutional Review Boards granted a waiver of informed consent for retrospective chart review. Accordingly, all Hispanic patients retrospectively recruited were included, but we could only include data from the subset of Hispanic patients who prospectively consented. Those who consented prospectively were only included. An equivalent number of NHW patients to Hispanic patients was selected to minimize research staff workload, as described elsewhere.

2.4 | Exposures

2.4.1 | PLD completion of the medical health questionnaire

This was the primary exposure defined as the number of PLDs per transplant candidate who completed the medical health questionnaire, Breeze™.

2.4.2 | PLDs verbally identified by candidates and families

This was a secondary exposure defined as the estimated number of PLDs per KT candidate, as verbally identified by candidates and/or their families during transplant evaluation. As this question was not asked as part of routine clinical practice in the retrospective data collection period, we only included this information in the prospective data collection period.

2.4.3 | PLD initiation of donor evaluation

This was a secondary exposure defined as the number of PLDs who initiated donor evaluation per transplant candidate.
2.5 | Outcomes

The outcomes of interest were: (1) kidney transplant status based on whether candidates received a kidney transplant (KT vs. not yet received KT), and (2) among transplant recipients, whether candidates received a LDLT (LDKT vs. DDKT).

2.6 | Statistical analysis

Descriptive statistics were reported to summarize waitlisted patients’ demographic and clinical characteristics. Categorical variables were reported as frequency and percentages, and continuous variables were reported as mean, standard deviation, median, interquartile range, and range of minimum and maximum. To evaluate the number of PLDs who completed Breeze™ per waitlisted candidates on receipt of transplant, multivariable logistic regression models were used. Two binary outcomes were: (1) receipt of KT (vs. not yet received transplant), and (2) receipt of LDKT (vs. DDKT) among transplant recipients. The model included binary variables for 1 or more PLDs (vs. zero), Hispanic (vs. NHW), and a two-way interaction term (1 or more vs. 0 number of PLDs comparison between Hispanic and NHW patients). The adjusted models included history of diabetes, history of hypertension, married/with a partner, and insurance status from a covariate set of demographic and clinical variables in Table 1, selected based on clinical experience and factors influencing patients’ receipt of LDKT.24–28 All analyses were conducted at the site-level given that each transplant program’s patient evaluation process and geographical location affect patient access to transplantation differently. All analyses were performed using SAS version 9.4 (Cary, NC).

3 | RESULTS

3.1 | Demographics

A total of 868 kidney transplant candidates were eligible for participation. However, after excluding 21 candidates whose PLDs had not completed Breeze™, the main predictor variable, the total sample of \( n = 847 \) candidates was included in the analyses (site A: \( n = 196 \), site B: \( n = 651 \)). Candidates were on average, age 52 years, primarily male (60.2%), most had some college or less education (69.3%), and most did not have private insurance (56.0%). Candidates’ leading cause of kidney failure was diabetes (44.0%), most had a history of hypertension (76.3%) or diabetes (48.8%), and were currently on dialysis (56.4%). Table 1 presents all candidates’ demographic and clinical characteristics by race/ethnicity within each site. Candidates’ demographic and clinical characteristics did not differ significantly between sites.

However, there were differences by race/ethnicity. For example, Hispanic candidates were generally younger (49.8 vs. 56.5 years), had lower education levels (84.3% vs. 56.6%), less private insurance (39.4% vs. 47.9%), and more diabetes (60.0% vs. 39.0%) than NHW candidates. Moreover, more Hispanic candidates were on dialysis (thus, had less opportunity to receive preemptive transplantation), and Hispanic candidates had a longer waiting time on dialysis, than NHW candidates.

3.2 | Number of PLDs per transplant candidate

Table 2 presents the number of PLDs per transplant candidate, along the continuum of donor evaluation. This continuum can be viewed as a funnel that tapers off, when reviewing the data in aggregate for each racial/ethnic group, starting with a large number of PLDs who candidates had identified as having expressed their interest in donating.

Across both sites, Hispanic and NHW candidates (and their accompanying family/friends) verbally reported a comparable number of PLDs interested in donating, which was divided by the number of Hispanic or NHW candidates to generate the PLD per potential recipient. For example, at Site A, a mean of 1.30 PLDs was reported per Hispanic candidate, while a mean of 1.27 PLDs was reported per NHW candidate. These numbers translated to an aggregate of 78 and 47 PLDs verbally identified by Hispanic and NHW candidates, respectively.

Thereafter, the mean number of PLDs completed Breeze™ per candidate generally declined across sites. For example, at site A, an average of 0.60 PLDs had completed Breeze™ per Hispanic candidate, while 1.92 PLDs had completed Breeze™ per NHW candidate. At Site A, the change in mean number of verbally identified PLDs per candidate to the number of PLDs who completed Breeze™ per candidate dropped by 54% for Hispanics but increased by 51% for NHW candidates.

Lastly, the number of PLDs who initiated donor evaluation per candidate further declined across sites. For example, at site A, a mean of 0.27 PLDs initiated evaluation per Hispanic candidate, while a mean of 1.43 PLDs initiated evaluation per NHW candidate. At Site A, the change in mean number of verbally identified PLDs per candidate to the number of PLDs who completed Breeze™ per candidate dropped by 55% for Hispanics but increased by 26% for NHW candidates. As these data show, Hispanic candidates within each site encountered greater declines in PLDs at the last two steps as compared to NHW candidates.

3.3 | Characteristics of candidates by number of PLDs completing Breeze™

As Table 3 shows, candidates with 0 versus 1 or more PLDs who completed Breeze™ exhibited demographic and clinical differences. Demographically, compared to candidates with 1 or more PLDs, candidates without any PLDs were significantly older (mean age 54.5 versus 52.1 years, \( p = .0006 \)). Candidates with no PLDs were more
| Characteristic                         | Overall, N = 847 | All Sites, n = 847 | Site A, n = 196 | Site B, n = 651 |
|---------------------------------------|------------------|-------------------|----------------|---------------|
| Age, years, mean±SD (range)           | 52.93 ± 13.66    | 49.80 ± 13.25     | 56.46 ± 13.26  | 50.36 ± 13.23 |
|                                        | (18–85)          | (18–77)           | (18–85)        | (18–77)       |
| Sex, male, n (%)                      | 510 (60.21)      | 227 (58.51)       | 283 (61.66)    | 168 (56.0)    |
| Marital status, married/partner, n (%)| 592 (69.89)      | 256 (65.98)       | 336 (73.20)    | 200 (66.7)    |
| Highest education level, college or above, n (%) | 260 (30.70) | 61 (15.72)        | 199 (43.36)    | 50 (16.7)     |
| Primary insurance coverage, private, n (%) | 373 (44.04) | 153 (39.43)       | 220 (47.93)    | 124 (41.3)    |
| BMI, kg/m², mean±SD (range)           | 29.06 ± 5.62     | 29.34 ± 5.54      | 28.73 ± 5.69   | 29.31 ± 5.22  |
|                                        | (15.44–53.08)    | (15.44–49.15)     | (15.82–53.08)  | (16.80–40.12) |
| History of hypertension, n (%)         | 646 (76.27)      | 302 (77.84)       | 344 (74.95)    | 232 (77.3)    |
| History of diabetes, n (%)             | 413 (48.76)      | 234 (60.31)       | 179 (39.00)    | 184 (61.3)    |
| Primary cause of ESRD, n (%)           |                 |                   |                |               |
| Diabetes                              | 373 (44.04)      | 209 (53.87)       | 164 (35.73)    | 162 (54.00)   |
| Hypertension                          | 134 (15.82)      | 61 (15.72)        | 73 (15.90)     | 39 (13.00)    |
| Focal glomerular sclerosis             | 48 (5.67)        | 18 (4.64)         | 30 (6.54)      | 15 (5.00)     |
| Chronic glomerulonephritis            | 32 (3.78)        | 15 (3.87)         | 17 (2.70)      | 12 (4.00)     |
| Polycystic kidney disease             | 79 (9.33)        | 15 (3.87)         | 64 (13.94)     | 12 (4.00)     |
| Iga nephropathy                       | 40 (4.72)        | 11 (2.84)         | 29 (6.32)      | 9 (3.00)      |
| Retransplant                          | 10 (1.18)        | 2 (0.52)          | 8 (1.74)       | 0 (0.00)      |
| Lupus                                 | 24 (2.83)        | 13 (3.35)         | 11 (2.40)      | 12 (4.00)     |
| Other                                 | 52 (6.14)        | 28 (7.22)         | 24 (5.23)      | 15 (5.00)     |
| Unknown                               | 55 (6.49)        | 16 (4.12)         | 39 (8.50)      | 39 (11.11)    |
| Currently on dialysis, n (%)           | 475 (56.43)      | 254 (65.46)       | 224 (48.80)    | 192 (64.0)    |
| Dialysis time (days), median [IQR]    | 375 [831]        | 447 [977]         | 274.5 [654]    | 415.5 [840]   |
| (range), n                            | (0, 6189), n = 465 | (0, 6189), n = 247 | (13, 4556), n = 218 | (2, 3075), n = 59 |
| Waiting time (days), median [IQR]     | 106 [142]        | 125 [162]         | 89 [122]       | 178 [166]     |
| (range), n                            | (8–1216), n = 844 | (8–1216), n = 385 | (3–1007), n = 459 | (14–1216), n = 87 |
| Number of prior transplants, n (%)    |                 |                   |                |               |
| 0 transplant                          | 772 (91.15)      | 360 (92.78)       | 412 (89.76)    | 275 (91.67)   |
| 1 transplant                          | 63 (7.44)        | 25 (6.44)         | 38 (8.28)      | 22 (7.33)     |
| 2+ transplants                        | 9 (1.06)         | 3 (0.77)          | 6 (1.31)       | 3 (1.00)      |

Abbreviation: SD, standard deviation.

a All study participants were waitlisted during January 2014 to December 2019.

b Data collected at the time of starting potential recipient evaluation.
likely to be Hispanic (48.2% vs. 43.1% \( p = .008 \)), less likely to be married or with a partner (64.5% vs. 75.9%, \( p < .0001 \)), have less than a college degree (71.0% vs. 67.4%, \( p < .0001 \)), and less likely to have private insurance (37.9% vs. 50.9%, \( p < .0001 \)).

Clinically, compared to candidates without any PLDs, candidates with 1 or more PLD had a lower proportion of a history of diabetes (44.6% vs. 52.5%, \( p = .005 \)), diabetes as the primary cause of kidney failure (38.6% vs. 48.9%, \( p = .022 \)), current dialysis (47.1% vs. 64.7%, \( p < .0001 \)); spent fewer days on dialysis (median 280 vs. 374.5, \( p < .0001 \)) and on the waiting list (median 85 vs. 108.5, \( p < .0001 \)); and had ultimately received more transplants (LDKT or DDKT) (\( p < .0001 \); and had ultimately received more transplants (LDKT or DDKT) (\( p < .0001 \).

### 3.5 Candidates' relationship between the number of PLDs per waitlisted candidates who completed Breeze™ and received KT

Table 4 presents the likelihood of candidates receiving a KT (vs. not yet received KT), and among transplant recipients, whether recipients received a LDKT (vs. DDKT) comparing 0 or 1 or more number of PLDs who completed Breeze™.

At site A, for both Hispanic and NHW candidates, the odds of receiving a KT (vs. not yet receiving a KT) were greater for those with 1 or more PLD(s) compared to no PLD (Hispanic: adjusted odds ratio (OR) = 2.26 (95% CI 1.13–4.53), \( p = .022 \); NHW: OR = 2.42 (95% CI 1.10–5.33), \( p = .028 \). There was no difference between the Hispanic and NHW candidate estimates (1+ vs. 0 PLDs) (\( p = .895 \)).

By contrast, at site B, for both Hispanic and NHW candidates, the odds of receiving a KT (vs. not yet receiving a KT) were greater but not significantly different for those with 1 or more PLD(s) compared to no PLD (Hispanic: OR = 1.17 (95% CI 0.75–1.83), \( p = .481 \); NHW: OR = 1.39 (95% CI 0.90–2.14), \( p = .138 \). There was no difference between the Hispanic and NHW candidate estimates (1+ vs. 0 PLDs) (\( p = .845 \)).

At site A, among Hispanic and NHW transplant recipients, the odds of receiving a LDKT (vs. DDKT) were greater for those with 1 or more PLD(s) compared to zero PLD (Hispanic: OR = 21.22 (95% CI 2.44–184.48), \( p = .0006 \); NHW: OR = 37.70 (95% CI 6.59–215.67), \( p < .0001 \). There was no difference between the Hispanic and NHW candidate estimates (1+ vs. 0 PLDs) (\( p = .646 \).
Similarly, at site B, among Hispanic and NHW transplant recipients, the odds of receiving a LDKT (vs. DDKT) were greater for those with 1 or more PLD(s) compared to zero LD (Hispanic: OR = 25.54 (95% CI 7.52–101.54), p < .0001; NHW: OR = 15.18 (95% CI 5.64–40.85), p < .001). There was no difference between the Hispanic and NHW candidate estimates (1+ vs. 0 PLDs) (p = .518).

### TABLE 3  Waitlisted candidates’ sociodemographic and clinical characteristics by number of potential living donors (PLDs) who completed Breeze™ per candidate, n = 847

| Characteristic | Zero number of PLDs, n = 448 | 1 or more number of PLDs, n = 399 | p-value |
|---------------|-------------------------------|-----------------------------------|---------|
| Age, years, mean±SD (range) | 54.57±12.95 (19–82) | 52.10±14.25 (18–85) | .0006 |
| Sex, n (%) | | | |
| Male | 275 (61.4) | 235 (58.9) | .745 |
| Female | 173 (38.6) | 164 (41.1) | |
| Race/ethnicity, n (column %) | | | |
| Hispanic | 216 (48.2) | 172 (43.1) | .008 |
| White | 232 (51.8) | 227 (56.9) | |
| Marital status, n (column %) | | | |
| Married/with partner | 289 (64.5) | 303 (75.9) | <.0001 |
| Other | 159 (35.5) | 96 (24.1) | |
| Highest education level, n (column %) | | | |
| College degree and above | 130 (29.0) | 130 (32.6) | <.0001 |
| Less than college degree | 318 (71.0) | 269 (67.4) | |
| Primary insurance coverage, n (column %) | | | |
| Private | 170 (37.9) | 203 (50.9) | <.0001 |
| Other | 278 (62.1) | 196 (49.1) | |
| BMI, kg/m², mean±SD (range) | 29.32±5.67 (16.64–49.15) | 29.05±5.76 (15.44–53.08) | .685 |
| History of hypertension, n (column %) | 336 (75.0) | 310 (77.7) | .823 |
| History of diabetes, n (column %) | 235 (52.5) | 178 (44.6) | .005 |
| Primary cause of ESRD, n (column %) | | | |
| Diabetes | 219 (48.9) | 154 (38.6) | .022 |
| Hypertension | 77 (17.2) | 57 (14.3) | |
| Focal glomerular sclerosis | 17 (3.8) | 31 (7.8) | |
| Chronic glomerulonephritis | 16 (3.6) | 16 (4.0) | |
| Polycystic kidney disease | 33 (7.4) | 46 (11.5) | |
| IgA nephropathy | 16 (3.6) | 24 (6.0) | |
| Retransplant | 5 (1.1) | 5 (1.3) | |
| Lupus | 12 (2.7) | 12 (3.0) | |
| Other | 25 (5.6) | 27 (6.8) | |
| Unknown | 28 (6.3) | 27 (6.8) | |
| Currently on dialysis, n (column %) | 290 (64.7) | 188 (47.1) | <.0001 |
| Time on dialysis (days), median [IQR] (range), n | 374.5 [951] (2, 6189), n = 290 | 280 [725] (0, 3321), n = 188 | <.0001 |
| Waiting time (days), median [IQR] (range), n | 108.5 [153] (8, 114), n = 446 | 85 [125] (3, 1216), n = 398 | <.0001 |
| Transplant, n (column %) | | | |
| LDKT | 12 (2.5) | 124 (31.1) | <.0001 |
| DDKT | 213 (47.5) | 134 (33.6) | |
| Transplant not received | 224 (50.0) | 141 (35.3) | |

Abbreviation: SD, standard deviation.

*There were no significant site differences.

*Data collected at the time of starting potential recipient evaluation.
Our study examined KT candidate characteristics relating to the availability of PLDs and likelihood of receiving a kidney transplant. Our findings are novel in highlighting how the availability of one or more PLD(s) who complete the medical health questionnaire is associated with a significantly greater likelihood of receiving a transplant, particularly a LDKT. Additionally, we did not observe statistically significant differences by race/ethnicity in KT receipt among recipients with at least one PLD.

Our findings showed that Hispanic and NHW candidates verbally reported a comparable proportion of PLDs per candidate. This finding advances understanding of the PLD evaluation process by discounting the differential access hypothesis, which presumes that lower rates of LDKT among Hispanic and other minoritized candidates are due to having fewer PLDs. By evaluating the reported number of verbal reports of interest in donating, rather than relying on the number of PLDs who actually initiated evaluation, we can see that Hispanic candidates have just as many PLDs from the outset as NHW candidates.

Clinical practice and research on LD evaluation commonly focuses on PLDs who complete the medical health questionnaire or initiate donor evaluation. However, as our findings and other reports show, this focus is too narrow. Transplant programs can recognize a broader number of PLDs by also accounting for transplant candidates' (and accompanying family/friends') verbally reported number of PLDs.

Our findings indicate that for Hispanic candidates, there was an even greater decrease in PLDs between the verbal report and completing Breeze™ and initiating donor evaluation than for NHW candidates. Specifically, NHW candidates had more than double the proportion of PLDs complete Breeze™ per candidate than Hispanic candidates. Our findings suggest that the disparity in donor evaluation arises early in the evaluation process. This disparity may have arisen due to demographic and structural factors. Demographically, Hispanic candidates in our sample were less educated than NHW candidates, and therefore may have been less Internet savvy or were even afraid to complete the online Breeze™ given the "digital divide," which is shrinking. The absence of a Spanish language telephone line to complete Breeze™ with a bilingual transplant nurse may have

![Diagram](image-url)
|                      | Site A, n = 196                                                                 | Site B, n = 651                                                                 |
|----------------------|--------------------------------------------------------------------------------|--------------------------------------------------------------------------------|
|                      | Comparison: 1+ versus 0 donors                                                   | Comparison: 1+ versus 0 donors                                                   |
|                      | OR\(^a\) (95% CI) p-value                                                      | OR\(^a\) (95% CI) p-value                                                      |
| KT versus not received KT | 0.04 (−0.98, 1.06), p = .942                                                   | −0.06 (−0.67, 0.55), p = .845                                                  |
| Hispanic             | 2.36 (1.22, 4.59), .011                                                        | 1.26 (0.82, 1.95), .293                                                        |
| NHW                  | 2.27 (1.05, 4.92), .028                                                        | 1.34 (0.88, 2.06), .177                                                        |
| LDKT versus DDKT     | −0.53 (−2.80, 1.74), p = .646                                                   | 0.65 (−0.90, 2.21), p = .411                                                   |
| Hispanic             | 16.11 (3.36, 77.2) .0005                                                       | 30.22 (8.99, 101.54), <.0001                                                  |
| NHW                  | 27.44 (5.31, 141.82), <.0001                                                   | 15.72 (5.92, 41.78), <.0001                                                   |
|                      | Adjusted\(^b\)                                                                 |                                                                 |
| KT versus not received KT | −0.07 (−1.11, 0.97), p = .895                                                   | −0.17 (−0.79, 0.45), p = .845                                                  |
| Hispanic             | 2.26 (1.13, 4.53), .022                                                        | 1.17 (0.75, 1.83), .481                                                        |
| NHW                  | 2.42 (1.10, 5.33), .028                                                        | 1.39 (0.90, 2.14), .138                                                        |
| LDKT versus DDKT     | −0.53 (−2.80, 1.74), p = .646                                                   | 0.52 (−1.06, 2.10), p = .518                                                   |
| Hispanic             | 21.22 (2.44, 184.48), .0006                                                    | 25.54 (7.52, 101.54), <.0001                                                  |
| NHW                  | 37.70 (6.59, 215.67), <.0001                                                   | 15.18 (5.64, 40.85), <.0001                                                   |

\(^a\)Odds ratio (95% confidence interval).

\(^b\)Adjusted for history of diabetes, history of hypertension, married/with partner and insurance (private vs. other). 5 patients not included in adjusted analyses for site A.

\(^c\)Compares the difference (Hispanic vs. NHW) of difference (1 or more PLDs vs. 0 PLDs), where b denotes the regression coefficient from the interaction term of Hispanic and PLDs in the logistic regression model.
comprised a structural barrier for Spanish-speaking PLDs. Thus, our data suggest that despite similar interest in donating across Hispanic and NHW candidates, systemic barriers may have arisen upon undergoing donor evaluation that generated disparities for Hispanic candidates in accessing LDKT.

However, the number of PLDs throughout donor evaluation declined more steeply among Hispanic than NHW candidates. The Hispanic population has higher rates of diabetes, hypertension, and obesity than the NHW population, which may explain why more Hispanic candidates’ PLDs were medically excluded after completing the medical health questionnaire than were NHW candidates’ PLDs. Other studies of candidates’ characteristics associated with racial/ethnic disparities in access to LDKT found that health insurance coverage contributed to racial and ethnic differences in LDKT.25,26

Given the impact of having PLDs on KT and LDKT, and the considerable drop-out rate for Hispanic PLDs undergoing evaluation, future research should evaluate, on a larger scale, whether transplant programs that help Hispanic candidates identify PLDs at the beginning of their transplant evaluation process could reduce disparities. Transplant programs primarily deliver one-on-one transplant education rather than group discussion.27 However, Hispanics prefer group education with family and friends.28 Education about living donation in a group setting may offer an optimal opportunity to help Hispanic patients recognize PLDs. Because most Hispanic candidates’ PLDs were biologically- and non-biologically-related family, including Hispanic patients’ family in the transplant education and evaluation process may help to increase PLDs.

Transplant providers have an opportunity to facilitate a discussion among the patient and family to address barriers to donation and enable them to verbally identify PLDs, reminding them that donor evaluation is kept confidential to prevent potential undue influence to donate. This is especially relevant when some PLDs wait to initiate evaluation after other PLDs have been ruled out. By tracking the number of verbally identified PLDs and their progress through the evaluation process, the provider could contact the patient, inform them of the number of PLDs who have been ruled out or have not yet been evaluated, and encourage patients to inform their family of this update, without asking them to donate. Therefore, recording the number of verbally reported PLDs in their medical records could potentially help providers follow-up with candidates regarding their PLDs. Systematic research should evaluate the impact of eliciting and tracking verbal reports of PLDs on increasing the number of PLDs initiating and completing donor evaluation.

Our study advances the literature by showing how having one or more PLDs appears to contribute to KT and LDKT access, and extends the work by others.29 However, the status of having one or more PLDs may be a surrogate for transplant program fast-tracking the evaluation of candidates with PLDs, or candidate and/or potential donor activation. KT recipient patient activation level is positively associated with LDKT receipt.30 Therefore, further research should ascertain the relationship between having one or more PLDs and these potential surrogates.

We found that the association between recipients having one or more PLDs and receipt of KT or LKDT was unrelated to ethnicity/race. This suggests that having one or more PLDs may help to mitigate racial/ethnic disparities in LDKT, which should be assessed in future research.

This study has strengths. This multi-site study was conducted in two geographic regions, supporting generalizability of findings. The study included a large PLD sample and novel granular data (i.e., nationality) on Hispanic candidates and their PLDs, which advances the literature on ethnic disparities in access to LDKT. Our study provides a rich analysis of the PLD evaluation process by examining novel predictor variables (i.e., verbal report).

Our study has limitations. Candidates included may not be representative of candidates elsewhere. Candidates’ verbal report of PLDs may not reflect actual numbers; some PLDs prefer to get evaluated without informing candidates, thus, our results may be more conservative. Analysis of one variable (verbal report) was collected during part of the analysis period. Hispanic candidates in our sample were primarily of Mexican national heritage; findings may vary for Hispanic patients of other nationalities. Medical records may not accurately depict patients’ race/ethnic identity,27 which could have led to bias in the results. Because Breeze™ became available in Spanish at the study sites in 2018, our findings may have underreported PLDs’ use of Breeze™.

5 | CONCLUSION

Our findings suggest that the availability of PLDs signifies a greater likelihood of access to kidney transplantation, particularly LDKT. Transplant programs tracking the availability of PLDs initiating evaluation, beginning with candidates’ verbal report of PLDs, may attain a more granular understanding of the sources of potential disparities in candidates’ access to LDKT.

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DATA AVAILABILITY STATEMENT

Research data are not shared to protect site confidentiality.

DISCLOSURE

The authors of this manuscript have no conflicts of interest to disclose as described by the American Journal of Transplantation.
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