

Sex Differences and Attitudes toward Living Donor Kidney Transplantation among Urban Black Patients on Hemodialysis

Avrum Gillespie,* Heather Hammer,[†] Stanislav Kolenikov,[‡] Athanasia Polychronopoulou,[§] Vladimir Ouzienko,[§] Zoran Obradovic,[§] Megan A. Urbanski,^{||} Teri Browne,[¶] and Patricio Silva*

Abstract

Background and objectives Living donor kidney transplantation, the treatment of choice for ESRD, is underused by women and blacks. To better understand sex differences in the context of potential barriers to living donor kidney transplantation, the Dialysis Patient Transplant Questionnaire was administered in two urban, predominantly black hemodialysis units.

Design, setting, participants, & measurements The Dialysis Patient Transplant Questionnaire was designed to study barriers to kidney transplantation from previously validated questions. Between July of 2008 and January of 2009, the Dialysis Patient Transplant Questionnaire was administered to 116 patients on hemodialysis, including potentially eligible and ineligible living donor kidney transplantation candidates. Of 101 patients who self-identified as black or African American, 50 (49.5%) patients had the questionnaire entirely administered by the researcher or assistant, 25 (24.8%) patients required some assistance, and 26 (25.7%) patients completed the Dialysis Patient Transplant Questionnaire entirely by themselves. Multiple logistic regression methods were used to determine if the observed bivariate associations and differences persisted when controlled for potential confounders.

Results Women were less likely to want living donor kidney transplantation compared with men (58.5% versus 87.5%, $P=0.003$), despite being nearly two times as likely as men to receive unsolicited offers for kidney transplant (73.2% versus 43.2%, $P=0.02$). They were also less likely to have been evaluated for a kidney transplant (28.3% versus 52.2%, $P=0.01$). The multiple logistic regression analysis showed that sex was a statistically significant predictor of wanting living donor kidney transplantation (women versus men odds ratio, 0.13; 95% confidence interval, 0.04 to 0.46), controlling for various factors known to influence transplant decisions. A sensitivity analysis indicated that mode of administration did not bias these results.

Conclusions In contrast to previous studies, the study found that black women were less likely to want living donor kidney transplantation compared with black men. Black women were also less likely to be evaluated for a kidney transplant, although they were more likely to receive an unsolicited living donor kidney transplantation offer.

Clin J Am Soc Nephrol 9: ●●●–●●●, 2014. doi: 10.2215/CJN.12531213

Introduction

For the majority of patients with ESRD, living donor kidney transplantation (LDKT) is the treatment of choice (1–11). However, LDKT is underused by several disadvantaged groups, including women and blacks. Although Ayanian *et al.* (12) found that women (especially black women) were less likely to want LDKT, recent studies of patients presenting for transplant evaluation have found racial differences but not sex differences in wanting LDKT (2,4,7,13–15). It is possible that sex differences in wanting LDKT might be underestimated when only patients presenting for transplant evaluation are studied.

To better understand sex differences in the context of potential barriers to LDKT, we administered the Dialysis Patient Transplant Questionnaire (DPTQ) (16) in two

urban, predominantly black hemodialysis units. The DPTQ was specifically designed to identify barriers to transplantation and living donor recruitment. Recent studies show the importance of studying center-level factors to better understand disparities (2,15). In fact, Weng *et al.* (2) suggest that single-center studies are almost requisite for studying barriers to LDKT because of the complexity of donor recruitment and conversion attitudes and behavior. In our study, all patients were eligible to participate in the study, regardless of their candidacy for kidney transplantation. We reasoned that the concerns and attitudes of both potentially eligible and ineligible LDKT candidates might help us develop targeted interventions designed to increase LDKT rates among black women and alleviate some existing disparities (17–19).

*Department of Medicine, Section of Nephrology and Kidney Transplantation, Temple University School of Medicine, Philadelphia, Pennsylvania; [†]Health Group and [‡]Advanced Methods Group, Abt SRBI, Inc., Silver Spring, Maryland; [§]Center for Data Analytics and Biomedical Informatics, Temple University, Philadelphia, Pennsylvania; ^{||}Department of Abdominal Organ Transplantation, Temple University Hospital, Philadelphia, Pennsylvania; and [¶]College of Social Work, University of South Carolina, Columbia, South Carolina

Correspondence:

Dr. Avrum Gillespie, Department of Medicine, Section of Nephrology and Kidney Transplantation, Temple University School of Medicine, Philadelphia, PA 19140. E-mail: avrum.gillespie@tuhs.temple.edu

Materials and Methods

Study Design

This study was a cross-sectional survey of patients on prevalent hemodialysis.

Participants and Setting

This study was conducted in two hemodialysis clinics affiliated with Temple University Hospital in Philadelphia, Pennsylvania. It included 101 English-speaking patients who understood and spoke English, self-identified as black or African American, and participated in a survey of 116 patients with ESRD on chronic hemodialysis conducted between July of 2008 and January of 2009 (16). The overall participation rate for the study was 99.1%. Patients on peritoneal dialysis were excluded from the study, because they accounted for <5% of the population. The study protocol was approved by the Temple University Institutional Review Board. Consenting patients selected their preferred mode of administration; 50 (49.5%) patients had the questionnaire entirely administered by a researcher or trained research assistant, 25 (24.8%) patients required some assistance, and 26 (25.7%) patients completed the paper questionnaire entirely by themselves during their dialysis session.

Data Collection and Measures

The survey data were collected with the Temple University Hospital DPTQ, an instrument designed with questions validated in previous studies and questions developed by Gillespie *et al.* (16). The DPTQ takes approximately 30 minutes to administer and is written at a 6th grade literacy level. It consists of 43 questions that assess demographic characteristics, social and emotional support, self-reported health, quality of life, effect of kidney disease, and views on kidney transplantation. Additional demographic, clinical, and transplant status data were extracted from the computerized medical record and merged with the survey data.

Analyses

SPSS (SPSS Inc.) (20) was used for the descriptive and bivariate statistical analyses. Stata (StataCorp) (21) and MATLAB (MathWorks) (22) were used for the multivariate analyses. The bivariate analyses compared all men and women on key demographic, health, and attitudinal variables shown to influence decisions about transplant. We also analyzed 78 patients <70 years old separately, because we felt that this threshold was conservative, despite the potential benefits of renal transplantation over age 70 years (23). To test for association between categorical variables, we conducted Fisher exact tests and chi-squared tests incorporating Yates correction for continuity as appropriate. For differences between means of continuous variables, we used two-tailed, two-sample *t* tests. For all tests, *P* value <0.05 was considered statistically significant.

Multiple logistic regression was used to determine if the observed sex difference in wanting LDKT persisted with the following potential confounders controlled: age, marital status, education, insurance type (2,24,25), peripheral vascular disease (PVD) documented by peripheral angiogram or limb bypass surgery, and survey administration mode. These predictors were selected as the best statistical predictors from an initial pool of potential predictors that also included functional status measured by burden of kidney disease (26), self-reported health (27), recovery time (28),

and nursing home residence as well as other comorbidities associated with LDKT underuse (14) and predictive of mortality (29): coronary artery disease (CAD) documented by coronary angioplasty or coronary artery bypass and congestive heart failure (CHF) documented by an ejection fraction <50%.

For the multivariate analysis, we created a binary outcome variable (want LDKT versus do not want or do not know) and used the Akaike information criterion (AIC) (30,31) to select the best subset of predictors among the pool of potential predictors on the casewise-deleted subsample of 89 patients (excluding 12 patients with missing data on marital status [*n*=1], dialysis vintage [*n*=2], religion [*n*=7], general health [*n*=1], and recovery time [*n*=1]). To prevent overfitting (32), we followed the recommendation of Harrell (33), restricted our attention to models with no more than three variables, and conducted an exhaustive enumeration of all such possible models.

Comparing patients with missing versus no missing data on each of the potential confounders revealed no differences in the explanatory or outcome variables. In fact, the proportion who wanted LDKT was identical in both groups. On determining that the selected predictors had no missing data, the best subset model selected by the AIC on the casewise-deleted sample of 89 patients was then fit to the full sample of 101 patients. The adjustment by Firth (34) was used to improve the AIC-selected model estimates, which is appropriate with small unbalanced samples.

To assess the stability of the multivariate results across model selection methods, we also estimated the models using a missing data-resistant internal validation approach (32), which partitioned the data for all 101 patients into five independent training and test sets. In contrast to the first method, in which model size was restricted to no more than three predictors to avoid overfitting, the second method enabled us to train all possible models with two, three, four, five, and six predictors on each of five training sets, calculate the area under the receiver operator curve (AUC) of each model on the corresponding test set, and select the best model using the highest average AUC on the basis of five independent experiments. This method also enabled us to balance the accuracy of the estimates, avoid the bias caused by leave-one-out crossvalidation or evaluation of the training and testing models on the entire dataset, and minimize the effects of data discrepancies by ensuring that both testing and training sets had examples of both outcomes (35).

Whereas the first approach specified a reference category for each predictor and compared each of the predictor categories to the reference category (*e.g.*, less than high school and more than high school education were each compared with the high school reference category), the internal validation approach created dummy variables for each predictor category (yes=1 and no=0) and compared each category with all other categories (*e.g.*, high school education compared with lower and higher levels of education and less than high school education compared with high school and more than high school education). We also combined insurance into three categories: (1) Medicaid only or Medicaid plus Medicare, (2) Medicare only, and (3) Medicare plus Health Maintenance Organization or private insurance. Only two patients had private insurance.

In addition to using two different but appropriate modeling techniques to investigate the stability of the multiple logistic regression results across modeling methods and although the chi-squared tests revealed no statistically significant association between mode of administration and sex ($P=0.55$), we conducted a sensitivity analysis to investigate the potential for social desirability bias (36) associated with interviewer presence and determine if there was a statistically significant interaction between sex and mode of administration (37). Lastly, we performed a chi-squared analysis of the bivariate associations between the predictors selected for the multivariate analysis and wanting LDKT to further investigate potential confounders.

Results

Participants

Tables 1 and 2 report sex-specific and overall demographic (Table 1) and health-related (Table 2) results for 101 black patients in the study. As shown in Table 1, only 22.6% of women compared with 55.3% of men were married

or living as a couple, whereas more women were widowed (32.1%) or never married (34%). In contrast, no statistically significant sex differences were observed in employment, education, insurance, religion, mean age, or percentage of patients age ≥ 70 years. The mean age for men was 57 years old (range=28–82), and the mean age for women was 61 years old (range=24–87); <13% of the patients had a college-level education, and only 3% of patients were employed at the time of interview. The majority of patients had Medicare and Medicaid coverage (30.7%) or Medicare with a Medicare Health Maintenance Organization (27.7%). Only two (2%) patients had private health insurance. Most patients were Protestant (69.1%).

As shown in Table 2, there were no statistically significant sex differences in ESRD diagnosis; the majority of patients had either diabetes (26.7%) or hypertension (29.7%). No statistically significant sex differences were observed in the type of hemodialysis vascular access, with the majority of patients having fistulas or grafts (73.3%). Only 20.2% of patients had been on dialysis for <1 year, with equal proportions of men and women. All

Table 1. Sex difference in demographics between black men and women

Characteristic	Men (n)	Women (n)	Total (n)	P Value ^a
Total	47.5% (48)	52.5% (53)	100% (101)	
Age (yr)	57±12.6	60.96±13.26	59.08±13.05	0.13 ^b
Age group (yr)	48	53	101	0.97
<70	77.1% (37)	77.4% (41)	77.2% (78)	
70 or older	22.9% (11)	22.6% (12)	22.8% (23)	
Marital status	47	53	100	0.002
Married/couple living together	55.3% (26)	22.6% (12)	38% (38)	
Divorced/separated	17% (8)	11.3% (6)	14% (14)	
Widowed	12.8% (6)	32.1% (17)	23% (23)	
Never married	14.9% (7)	34% (18)	25% (25)	
Education	48	53	101	0.08
Grade 9 or less	10.4% (5)	22.6% (12)	16.8% (17)	
High school	68.8% (33)	56.6% (30)	62.4% (63)	
Technical or vocational	12.5% (6)	3.8% (2)	7.9% (8)	
Some college	8.3% (4)	17% (9)	12.9% (13)	
Employment	48	53	101	0.09 ^c
Employed	4.2% (2)	1.9% (1)	3% (3)	
Unemployed	8.3% (4)	1.9% (1)	5% (5)	
Retired	27.1% (13)	32.1% (17)	29.7% (30)	
Disabled	60.4% (29)	47.2% (25)	53.5% (54)	
Homemaker	0% (0)	17.0% (9)	8.9% (9)	
Health insurance	48	53	101	0.26 ^c
Medicare only	18.8% (9)	11.3% (6)	14.9% (15)	
Medicaid only	14.6% (7)	34.0% (18)	24.8% (25)	
Medicare+Medicaid	37.5% (18)	24.5% (13)	30.7% (31)	
Medicare+HMO	25.0% (12)	30.2% (16)	27.7% (28)	
Private only	4.2% (2)	0.0% (0)	2.0% (2)	
Religion	44	50	94	0.38 ^c
Catholic	6.8% (3)	4% (2)	5.3% (5)	
Protestant	59.1% (26)	78% (39)	69.1% (65)	
Other	15.9% (7)	12% (6)	13.8% (13)	
No affiliation	18.2% (8)	6% (3)	11.7% (11)	

HMO, Health Maintenance Organization.

^aP value calculated by Pearson chi-squared test unless otherwise noted.

^bP value calculated by *t* test.

^cYates *P* value.

Characteristic	Men (n)	Women (n)	Total (n)	P Value ^a
Total	47.5% (48)	52.5% (53)	100% (101)	
ESRD diagnosis	48	53	101	0.92 ^b
Diabetes	22.9% (11)	30.2% (16)	26.7% (27)	
Hypertension	33.3% (16)	26.4% (14)	29.7% (30)	
GN	4.2% (2)	5.7% (3)	5.0% (5)	
Other	39.6% (19)	37.7% (20)	38.6% (39)	
Access type	48	53	101	0.12
Fistula	33.3% (16)	17.0% (9)	24.8% (25)	
Catheter	27.1% (13)	26.4% (14)	26.7% (27)	
Graft	39.6% (19)	56.6% (30)	48.5% (49)	
Dialysis vintage, yr	48	51	99	0.66
<1	16.7% (8)	23.5% (12)	20.2% (20)	
1–5	45.8% (22)	39.2% (20)	42.4% (42)	
>5	37.5% (18)	37.3% (19)	37.4% (37)	
Nursing home resident	6.2% (3)	0.0% (0)	3.0% (3)	0.10 ^c
Comorbidities	48	53	101	
Peripheral vascular disease	25.0% (12)	11.3% (6)	17.8% (18)	0.07
Coronary artery disease	18.8% (9)	28.3% (15)	23.8% (24)	0.26
Congestive heart failure	18.8% (9)	13.2% (7)	15.8% (15)	0.45
Median recovery time (min)	180	120	150	0.19 ^d
25th percentile	45	70	60	
75th percentile	240	315	260	
General health	48	52	100	0.81 ^b
Excellent	4.2% (2)	3.8% (2)	4.0% (4)	
Very good	10.4% (5)	9.6% (5)	10.0% (10)	
Good	43.8% (21)	30.8% (16)	37% (37)	
Fair	33.3% (16)	42.3% (22)	38% (38)	
Poor	8.3% (4)	13.5% (7)	11% (11)	
Bothered by kidney disease	48	53	101	0.99
Not at all	25% (12)	22.6% (12)	23.8% (24)	
Somewhat	27.1% (13)	30.2% (16)	28.7% (29)	
Moderately	22.9% (11)	22.6% (12)	22.8% (23)	
Very much	16.7% (8)	15.1% (8)	15.8% (16)	
Extremely	8.3% (4)	9.4% (5)	8.9% (9)	

^aP value calculated by Pearson chi-squared test unless otherwise noted.
^bYates P value.
^cFisher exact test P value.
^dP value calculated by t test for differences between mean recovery time in minutes for men versus women (202 versus 280 minutes).

three nursing home patients were men. PVD was present in 17.8% of patients, CAD was present in 23.8% of patients, and CHF was present in 15.8% of patients, with no significant sex differences in PVD, CAD, or CHF. The median recovery time after dialysis was 2.5 hours (150 minutes), with no statistically significant sex differences. No statistically significant sex differences were evident in self-reported health or perceived burden of kidney disease.

Attitudes toward Transplantation

Whereas 72% of the surveyed patients wanted LDKT, women (58.5%) were less likely to want LDKT compared with men (87.5%) (Table 3). Similarly, only 56.6% of women wanted a deceased donor kidney transplant (DDKT) compared with 85.4% of men. Men were almost two times as likely as women to want a kidney transplant evaluation (75.6% versus 42%) and almost two times as likely to be evaluated (52.2% versus 28.3%). Women were also twice as likely to have changed their minds

about wanting a kidney transplant compared with men (39.6% versus 16.7%). Although proportionately more men were on the kidney transplant waiting list at time of interview compared with women (31.3% versus 18.9%), the difference was not statistically significant.

As shown in Table 4, when patients age ≥ 70 years were excluded from the bivariate analysis, the sex differences persisted. Although younger women were more likely to receive an unsolicited offer from a potential living donor than younger men (73.2% versus 43.2%), they were less likely to want either LDKT (65.9% versus 89.2%) or DDKT (58.5% versus 86.5%). Of the women who did not want LDKT, 71.4% received unsolicited offers for LDKT, whereas 25% of men who did not want LDKT received offers ($P=0.25$; not shown in the tables). Younger women were less likely to be evaluated (34.1% versus 63.9%) and less likely to want a transplant evaluation (48.7% versus 85.3%). They were also more likely to have changed their mind about transplantation compared with younger men (43.9% versus 13.5%).

Table 3. Kidney transplantation attitudes and status among all study participants

Attitudes and Status	Men (n)	Women (n)	Total (n)	P Value ^a
Total	47.5% (48)	52.5% (53)	100% (101)	
Would accept LDKT	48	53	101	0.003
Yes	87.5% (42)	58.5% (31)	72.3% (73)	0.001 ^b
No	10.4% (5)	24.5% (13)	17.8% (18)	
Do not know	2.1% (1)	17% (9)	9.9% (10)	
Would accept DDKT	48	53	101	0.004
Yes	85.4% (41)	56.6% (30)	70.3% (71)	
No	4.2% (2)	24.5% (13)	14.9% (15)	
Do not know	10.4% (5)	18.9% (10)	14.9% (15)	
Waitlisted	48	53	101	0.15
Yes	31.3% (15)	18.9% (10)	24.8% (25)	
No	68.8% (33)	81.1% (43)	75.2% (76)	
Want transplant evaluation	45	50	95	<0.01 ^c
Yes	75.6% (34)	42% (21)	57.9% (55)	
No	22.2% (10)	44% (22)	33.7% (32)	
Do not know	2.2% (1)	14% (7)	8.4% (8)	
Being evaluated for transplant	46	53	99	0.01 ^d
Yes	52.2% (24)	28.3% (15)	39.4% (39)	0.07 ^c
No	45.7% (21)	71.7% (38)	59.6% (59)	
Do not know	2.2% (1)	0% (0)	1% (1)	
Want more information	47	52	99	0.17 ^c
Yes	80.9% (38)	61.5% (32)	70.7% (70)	
No	14.9% (7)	32.7% (17)	24.2% (24)	
Do not know	4.3% (2)	5.8% (3)	5.1% (5)	
Received unsolicited LDKT offer	48	53	101	0.02 ^e
Yes	37.5% (18)	60.4% (32)	49.5% (50)	
No	60.4% (29)	37.7% (20)	48.5% (49)	
Do not know	2.1% (1)	1.9% (1)	2.0% (2)	
Changed mind about LDKT	48	53	101	0.01 ^e
Yes	16.7% (8)	39.6% (21)	28.7% (29)	
No	81.2% (39)	58.5% (31)	69.3% (70)	
Do not know	2.1% (1)	1.9% (1)	2% (2)	

LDKT, living donor kidney transplant; DDKT, deceased donor kidney transplant.

^aP value calculated by Pearson chi-squared test unless otherwise noted.

^bP value calculated by Pearson chi-squared test for 2×2 table combining no and do not know.

^cYates P value.

^dP value calculated excluding do not know (one patient).

^eP value calculated excluding do not know (two patients).

Multivariate Analyses and Sensitivity Analyses

To determine if the bivariate sex results were confounded by other factors, we used multiple logistic regression methods to select the best subset model for wanting LDKT among the pool of potential predictors. Table 5 reports the best-fitting model selected by two different but appropriate modeling techniques. The first method used the AIC to select the best subset model on the basis of the casewise-deleted sample of 89 patients and then fit this model to the full sample of 101 patients. The statistically significant odds ratios for both the casewise-deleted and full samples show that, after controlling for other potential confounders, black women were less likely to want LDKT compared with black men. This finding was supported by a sensitivity analysis that found no statistically significant interaction between sex and mode of administration when included in a model with only these two variables.

Although the odds ratio for PVD was not statistically significant in the full sample model ($P=0.06$), the statistically significant odds ratio for the casewise-deleted sample

suggests that patients with PVD were less likely to want LDKT compared with those patients without PVD. Both models have adequate fit, which was indicated by the non-significant Hosmer–Lemeshow P values and AUC values over 0.70.

Table 5 also reports the best internal validation model selected to maximize the AUC rather than minimize the AIC. Consistent with the AIC selection, the internal validation selection shows that black women were less likely to want LDKT compared with black men, as were patients with PVD compared with those without PVD. In contrast to the AIC selection, which was made on casewise-deleted data and restricted to a maximum of three predictors, the best model selected with the missing data-resistant internal validation method included marital status and education in addition to sex and PVD.

Patients who were married or living as a couple and widowed patients were less likely to want LDKT compared with all other marital categories, although only widowed

Attitudes and Status	Men (n)	Women (n)	Total (n)	P Value ^a
Age <70 yr old	47.4% (37)	52.6% (41)	100% (78)	0.97
Would accept an LDKT ^b	89.2% (33)	65.9% (27)	76.9% (60)	0.01
Would accept a DDKT ^b	86.5% (32)	58.5% (24)	71.8% (56)	<0.01
Waitlisted ^b	37.8% (14)	22.0% (9)	29.5% (2)	0.12
Want to be evaluated ^b	85.3% (29)	48.7% (19)	65.8% (48)	0.001
Being evaluated for kidney transplant ^b	63.9% (23)	34.1% (14)	48.1% (37)	<0.01
Want more information ^b	77.8% (28)	75.0% (30)	76.3% (58)	0.78
Received unsolicited LDKT offer ^b	43.2% (16)	73.2% (30)	59.0% (46)	<0.01
Changed mind about kidney transplant ^b	13.5% (5)	43.9% (18)	29.5% (23)	0.003
Declined a live kidney donation offer ^b	25.0% (1)	71.4% (10)	61.1% (11)	0.24

^aP value calculated by Pearson chi-squared test.
^bPercentages calculated using column totals and reported for those who replied yes versus no or do not know to the question.

Variable and Model Fit Statistic	Best Casewise-Deleted Subsample Model (n=89)		Best Casewise-Deleted Model Fit to Full Sample (n=101)		Best Internal Validation Full-Sample Model (n=101)	
	OR (95% CI)	P Value	OR (95% CI)	P Value	OR (95% CI)	P Value
Women	0.13 (0.04 to 0.46)	0.001	0.17 (0.06 to 0.49)	0.001	0.15 (0.04 to 0.46)	0.002
PVD	0.19 (0.05 to 0.75)	0.02	0.31 (0.09 to 1.03)	0.06	0.27 (0.07 to 0.97)	0.05
High school education					1.12 (0.40 to 3.07)	0.84
Married/couple living together					0.5 (0.14 to 1.65)	0.27
Widowed					0.27 (0.08 to 0.92)	0.04
AIC	91.85		105.29		111.98	
Hosmer–Lemeshow P value	0.30		0.80		0.75	
AUC	0.72		0.72		0.84	

PVD, peripheral vascular disease; AIC, Akaike information criterion; AUC, area under the receiver operator curve; OR, odds ratio; 95% CI, 95% confidence interval.

patients (all women) had a statistically significant odds ratio. Although the odds ratio was not statistically significant, patients who completed high school were more likely to want LDKT compared with patients with less than high school or postsecondary education. Table 6 reports the bivariate associations between the variables selected for the multivariate analyses and wanting LDKT. Only sex had a statistically significant bivariate association with wanting LDKT.

Discussion

Our survey of 101 self-identified black patients with ESRD regarding LDKT found that women were significantly less likely than men to want LDKT. They were also less likely to want DDKT and less likely to be evaluated for a kidney transplant, despite being more likely to receive an unsolicited LDKT offer. Regardless of how we approached the multiple logistic regression modeling, sex was a statistically significant predictor of wanting LDKT. PVD and marital status were also statistically significant predictors.

Whereas our overall percentage of black patients interested in either DDKT or LDKT (72.3%) was almost identical to an earlier study (2), our study diverges from previous studies (2,4,7,13–15) in that significantly more black men (82.8%) wanted LDKT compared with women (58.6%). Although there is some evidence that age may affect attitudes toward transplantation (2), younger women were less likely to want LDKT compared with younger men. Importantly, younger women were more likely to receive unsolicited offers for kidney donation compared with men regardless of age, even when they did not want an LDKT. This finding identifies a potential opportunity to increase the frequency of living donor transplantation among black women.

Even so, we are concerned by the finding that, among black patients with ESRD, women were less likely to want LDKT and DDKT compared with men. One may speculate that this sex disparity is associated with sex differences in health care use. Previous research found that, although women tend to visit doctors more often than men (38), men

Table 6. Bivariate associations for the final pool of potential multiple regression model predictors for wanting living donor kidney transplant

Variable	Want LDKT Percent (<i>n</i>)	Does Not Want LDKT or Unsure Percent (<i>n</i>)	<i>P</i> Value ^a
Sex			0.001
Men	87.5 (42)	12.5 (6)	
Women	58.5 (31)	41.5 (22)	
PVD			0.24
Yes	61.1 (11)	38.9 (7)	
No	74.7 (62)	25.3 (21)	
Education			0.31
Grade 9 or less	58.8 (10)	41.2 (7)	
High school	73 (46)	27 (17)	
Technical/vocational/some college	81 (17)	19 (4)	
Marital status			0.10
Married or living as a couple	76.3 (29)	23.7 (9)	
Divorced/separated	85.7 (12)	14.3 (2)	
Widowed	52.2 (12)	47.8 (11)	
Never married	76 (19)	24 (6)	
Age group (yr)			0.06
<70	76.9 (60)	23.1 (18)	
70 or older	56.5 (13)	43.5 (10)	
Mode of administration			0.91
Self-administered	69.2 (18)	30.8 (18)	
Interviewer assisted	72 (18)	28 (7)	
Interviewer administered	74 (37)	26 (13)	
Insurance			0.19
Medicaid+Medicare or Medicaid only	78.6 (44)	21.4 (12)	
Medicare only	73.3 (11)	26.7 (4)	
Medicare+HMO or private only	60 (18)	40 (12)	

^a*P* value calculated by Pearson chi-squared test.

take more of an operational approach to health care. Men were also more likely to want aggressive therapy, such as total joint arthroplasty for severe arthritis (39) or coronary angiography and revascularization for CAD (40). Women with CKD have been found to have low self-esteem (41) and possibly, a lack of strong social support (38). Lack of strong social support may explain why the widowed patients (all of whom were women) were less likely to want LDKT in the multivariate analysis. This finding also suggests that, in addition to educating patients about health and quality of life benefits, the availability or lack of social support should be factored into the design of interventions (8,42–51). It is also important to note that black women are also more likely to be excluded from living kidney donation for medical reasons (52).

In contrast to other studies, surveying patients in the hemodialysis clinics enabled us to enroll patients who had not presented for transplant evaluation, which may explain why we found sex differences that were not found in studies excluding these patients. To understand the barriers that may have prevented patients from getting a transplant had they been medically suitable, we deliberately included patients who may have been unsuitable for transplant. Moreover, their attitudes may have influenced others who were medically suitable (17–19). Severe PVD is a relative contra-indication to transplantation at our center and a known predictor of morbidity and mortality in ESRD (29), which may explain why these patients were less likely to want LDKT.

Our study must be considered in the context of its limitations. The results are on the basis of a convenience sample of 101 urban-dwelling black patients with ESRD at two hemodialysis clinics affiliated with a university hospital in north Philadelphia that serve a largely minority low-income patient population (53). Despite their comparatively high rate of transplant referral, our patients are similar to other patients in that many do not complete the workup step toward the waitlist (13,16,48). Although other studies show that patients with private insurance have better access to LDKT (24,25), only two of our patients had private insurance, and neither wanted an LDKT. The low employment rate of our patients is reflected in the fact that Medicare+Medicaid is the most common health insurance.

Although our results may not be generalizable to a national ESRD population, they are relevant to providers who serve urban patient populations, which account for over 80% of the ESRD population (54). Larger populations and larger probability samples from socioeconomically diverse urban and rural centers are needed to explore the relevance of our findings for other hemodialysis settings as well as patients on peritoneal dialysis. Moreover, without a comparison group, we cannot speak to any racial or ethnic differences in terms of sex. Nevertheless, the DPTQ may be useful for individual centers and transplant programs to identify barriers to transplantation unique to the population that they serve and tailor their interventions accordingly.

In conclusion, we found that black women were less likely to want an LDKT than men, although they were two times as likely to receive unsolicited offers for kidney donation. Future research is needed to see if sex-specific educational and social interventions can be tailored to help overcome these barriers and identify other modifiable barriers.

Acknowledgments

The authors thank the Temple University–affiliated ESRD program and survey participants.

Disclosures

The research for this paper was unfunded, Dr. Gillespie subsequently has received a Norman S. Coplun Satellite Health Care Foundation Grant to study “The Formation and Influence of Hemodialysis Patient Social Networks on Patient Knowledge, Attitudes, Dietary and Medication Adherence, and Transplantation”.

References

1. US Renal Data System: *USRDS 2010 Annual Data Report: Atlas of Chronic Kidney Disease and End-Stage Renal Disease in the United States*, Bethesda, MD, National Institutes of Health, National Institute of Diabetes and Digestive and Kidney Diseases, 2010
2. Weng FL, Reese PP, Mulgaonkar S, Patel AM: Barriers to living donor kidney transplantation among black or older transplant candidates. *Clin J Am Soc Nephrol* 5: 2338–2347, 2010
3. Boulware LE, Meoni LA, Fink NE, Parekh RS, Kao WH, Klag MJ, Powe NR: Preferences, knowledge, communication and patient-physician discussion of living kidney transplantation in African American families. *Am J Transplant* 5: 1503–1512, 2005
4. Lunsford SL, Simpson KS, Chavin KD, Hildebrand LG, Miles LG, Shilling LM, Smalls GR, Baliga PK: Racial differences in coping with the need for kidney transplantation and willingness to ask for live organ donation. *Am J Kidney Dis* 47: 324–331, 2006
5. Abecassis M, Bartlett ST, Collins AJ, Davis CL, Delmonico FL, Friedewald JJ, Hays R, Howard A, Jones E, Leichtman AB, Merion RM, Metzger RA, Pradel F, Schweitzer EJ, Velez RL, Gaston RS: Kidney transplantation as primary therapy for end-stage renal disease: A National Kidney Foundation/Kidney Disease Outcomes Quality Initiative (NKF/KDOQI™) conference. *Clin J Am Soc Nephrol* 3: 471–480, 2008
6. Eggers PW: Racial differences in access to kidney transplantation. *Health Care Financ Rev* 17: 89–103, 1995
7. Epstein AM, Ayanian JZ, Keogh JH, Noonan SJ, Armistead N, Cleary PD, Weissman JS, David-Kasdan JA, Carlson D, Fuller J, Marsh D, Conti RM: Racial disparities in access to renal transplantation—clinically appropriate or due to underuse or overuse? *N Engl J Med* 343: 1537–1544, 2000
8. Laupacis A, Keown P, Pus N, Krueger H, Ferguson B, Wong C, Muirhead N: A study of the quality of life and cost-utility of renal transplantation. *Kidney Int* 50: 235–242, 1996
9. Wolfe RA, Ashby VB, Milford EL, Ojo AO, Ettenger RE, Agodoa LY, Held PJ, Port FK: Comparison of mortality in all patients on dialysis, patients on dialysis awaiting transplantation, and recipients of a first cadaveric transplant. *N Engl J Med* 341: 1725–1730, 1999
10. Alobaidli A, Jassal SV: Renal transplantation in seniors - a review. *Saudi J Kidney Dis Transpl* 16: 431–442, 2005
11. Gordon EJ: “They don’t have to suffer for me”: Why dialysis patients refuse offers of living donor kidneys. *Med Anthropol Q* 15: 245–267, 2001
12. Ayanian JZ, Cleary PD, Weissman JS, Epstein AM: The effect of patients’ preferences on racial differences in access to renal transplantation. *N Engl J Med* 341: 1661–1669, 1999
13. Reese PP, Shea JA, Berns JS, Simon MK, Joffe MM, Bloom RD, Feldman HI: Recruitment of live donors by candidates for kidney transplantation. *Clin J Am Soc Nephrol* 3: 1152–1159, 2008
14. Gore JL, Danovitch GM, Litwin MS, Pham PT, Singer JS: Disparities in the utilization of live donor renal transplantation. *Am J Transplant* 9: 1124–1133, 2009
15. Hall EC, James NT, Garonzik Wang JM, Berger JC, Montgomery RA, Dagher NN, Desai NM, Segev DL: Center-level factors and racial disparities in living donor kidney transplantation. *Am J Kidney Dis* 59: 849–857, 2012
16. Gillespie A, Hammer H, Lee J, Nnewiwe C, Gordon J, Silva P: Lack of listing status awareness: Results of a single-center survey of hemodialysis patients. *Am J Transplant* 11: 1522–1526, 2011
17. Klassen AC, Hall AG, Saksvig B, Curbow B, Klassen DK: Relationship between patients’ perceptions of disadvantage and discrimination and listing for kidney transplantation. *Am J Public Health* 92: 811–817, 2002
18. Browne T: The relationship between social networks and pathways to kidney transplant parity: Evidence from black Americans in Chicago. *Soc Sci Med* 73: 663–667, 2011
19. Xi W, Harwood L, Diamant MJ, Brown JB, Gallo K, Sontrop JM, MacNab JJ, Moist LM: Patient attitudes towards the arteriovenous fistula: A qualitative study on vascular access decision making. *Nephrol Dial Transplant* 26: 3302–3308, 2011
20. SPSS Inc: *SPSS: Version 23*, Chicago, SPSS Inc., 2013
21. StataCorp: *Stata: Release 13. Statistical Software*, College Station, TX, StataCorp LP, 2013
22. MATLAB: *MathWorks, Inc.*, Natick, MA, MATLAB, 2014
23. Rao PS, Merion RM, Ashby VB, Port FK, Wolfe RA, Kayler LK: Renal transplantation in elderly patients older than 70 years of age: Results from the Scientific Registry of Transplant Recipients. *Transplantation* 83: 1069–1074, 2007
24. Johansen KL, Zhang R, Huang Y, Patzer RE, Kutner NG: Association of race and insurance type with delayed assessment for kidney transplantation among patients initiating dialysis in the United States. *Clin J Am Soc Nephrol* 7: 1490–1497, 2012
25. Kucirka LM, Grams ME, Balhara KS, Jaar BG, Segev DL: Disparities in provision of transplant information affect access to kidney transplantation. *Am J Transplant* 12: 351–357, 2012
26. Korevaar JC, Merkus MP, Jansen MA, Dekker FW, Boeschoten EW, Krediet RT; NECOSAD-study group: Validation of the KDQOL-SF: A dialysis-targeted health measure. *Qual Life Res* 11: 437–447, 2002
27. Thong MS, Kaptein AA, Benyamini Y, Krediet RT, Boeschoten EW, Dekker FW; Netherlands Cooperative Study on the Adequacy of Dialysis (NECOSAD) Study Group: Association between a self-rated health question and mortality in young and old dialysis patients: A cohort study. *Am J Kidney Dis* 52: 111–117, 2008
28. Lindsay RM, Heidenheim PA, Nesrallah G, Garg AX, Suri R; Daily Hemodialysis Study Group London Health Sciences Centre: Minutes to recovery after a hemodialysis session: A simple health-related quality of life question that is reliable, valid, and sensitive to change. *Clin J Am Soc Nephrol* 1: 952–959, 2006
29. Moss AH, Ganjoo J, Sharma S, Gansor J, Senft S, Weaner B, Dalton C, MacKay K, Pellegrino B, Anantharaman P, Schmidt R: Utility of the “surprise” question to identify dialysis patients with high mortality. *Clin J Am Soc Nephrol* 3: 1379–1384, 2008
30. Akaike H: A new look at the statistical model identification. *IEEE Trans Automat Contr* 9: 716–723, 1974
31. Kuk AYC, Li J, Rush AJ: Variable and threshold selection to control predictive accuracy in logistic regression [published online ahead of print March 10, 2014]. *J R Stat Soc Ser C Appl Stat doi: 10.1111/rssc.12058*
32. Kalil AC, Mattei J, Florescu DF, Sun J, Kalil RS: Recommendations for the assessment and reporting of multivariable logistic regression in transplantation literature. *Am J Transplant* 10: 1686–1694, 2010
33. Harrell FE: *Regression Modeling Strategies: With Applications to Linear Models, Logistic Regression, and Survival Analysis (Springer Series in Statistics)*, Berlin, Springer, 2010
34. Firth D: Bias reduction of maximum likelihood estimates. *Biometrika* 80: 27–38, 1993
35. Zaki MJ, Meira W: *Data Mining and Analysis: Fundamental Concepts and Algorithms*, Cambridge, United Kingdom, Cambridge University Press, 2014
36. Biemer P, Groves RM, Lyberg LE, Mathiowetz N, Sudman S: *Measurement Errors in Surveys*, New York, John Wiley & Sons, 1991
37. Hosmer DW Jr., Lemeshow S: *Applied Logistic Regression*, John Wiley & Sons, 2004
38. Hunt K, Ford G, Harkins L, Wyke S: Are women more ready to consult than men? Gender differences in family practitioner

- consultation for common chronic conditions. *J Health Serv Res Policy* 4: 96–100, 1999
39. Hawker GA, Wright JG, Coyte PC, Williams JI, Harvey B, Glazier R, Badley EM: Differences between men and women in the rate of use of hip and knee arthroplasty. *N Engl J Med* 342: 1016–1022, 2000
 40. Roger VL, Farkouh ME, Weston SA, Reeder GS, Jacobsen SJ, Zinsmeister AR, Yawn BP, Kopecky SL, Gabriel SE: Sex differences in evaluation and outcome of unstable angina. *JAMA* 283: 646–652, 2000
 41. Baines LS, Jindal RM: *The Struggle for Life: A Psychological Perspective of Kidney Disease and Transplantation*. Praeger Series in Health Psychology, Westport, CT 2003
 42. Crawford BM, Meana M, Stewart D, Cheung AM: Treatment decision making in mature adults: Gender differences. *Health Care Women Int* 21: 91–104, 2000
 43. Clemens KK, Thiessen-Philbrook H, Parikh CR, Yang RC, Karley ML, Boudville N, Ramesh Prasad GV, Garg AX; Donor Nephrectomy Outcomes Research (DONOR) Network: Psychosocial health of living kidney donors: A systematic review. *Am J Transplant* 6: 2965–2977, 2006
 44. Ibrahim HN, Foley R, Tan L, Rogers T, Bailey RF, Guo H, Gross CR, Matas AJ: Long-term consequences of kidney donation. *N Engl J Med* 360: 459–469, 2009
 45. Mange KC, Joffe MM, Feldman HI: Effect of the use or nonuse of long-term dialysis on the subsequent survival of renal transplants from living donors. *N Engl J Med* 344: 726–731, 2001
 46. Meier-Kriesche HU, Kaplan B: Waiting time on dialysis as the strongest modifiable risk factor for renal transplant outcomes: A paired donor kidney analysis. *Transplantation* 74: 1377–1381, 2002
 47. Zheng K, Newman MW, Veinot TC, Hanratty M, Kim H, Meadowbrooke C, Perry EE: Using online peer-mentoring to empower young adults with end-stage renal disease: A feasibility study. *AMIA Annu Symp Proc* 2010: 942–946, 2010
 48. Rodrigue JR, Cornell DL, Kaplan B, Howard RJ: A randomized trial of a home-based educational approach to increase live donor kidney transplantation: Effects in blacks and whites. *Am J Kidney Dis* 51: 663–670, 2008
 49. Boulware LE, Hill-Briggs F, Kraus ES, Melancon JK, McGuire R, Bonhage B, Senga M, Ephraim P, Evans KE, Falcone B, Troll MU, Depasquale N, Powe NR: Protocol of a randomized controlled trial of culturally sensitive interventions to improve African Americans' and non-African Americans' early, shared, and informed consideration of live kidney transplantation: The Talking About Live Kidney Donation (TALK) Study. *BMC Nephrol* 12: 34, 2011
 50. Curtis CE, Rothstein M, Hong BA: Stage-specific educational interventions for patients with end-stage renal disease: Psychological and psychiatric considerations. *Prog Transplant* 19: 18–24, 2009
 51. Waterman AD, Stanley SL, Covelli T, Hazel E, Hong BA, Brennan DC: Living donation decision making: Recipients' concerns and educational needs. *Prog Transplant* 16: 17–23, 2006
 52. Reeves-Daniel A, Adams PL, Daniel K, Assimos D, Westcott C, Alcorn SG, Rogers J, Farney AC, Stratta RJ, Hartmann EL: Impact of race and gender on live kidney donation. *Clin Transplant* 23: 39–46, 2009
 53. United States Census Bureau. Table S1901: Income in the Past 12 Months (in 2012 Inflation Adjusted Dollars), based on 2008–2012 American Community Survey 5-Year Estimates. Available at: http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_12_5YR_S1901. Accessed March 17, 2014
 54. MedPac: Report to Congress: Medicare Payment Policy March 2012. Outpatient Dialysis. Available at: http://www.medpac.gov/chapters/Mar12_Ch06.pdf. Accessed March 17, 2014
- Received:** December 10, 2013 **Accepted:** July 9, 2014
- Published online ahead of print. Publication date available at www.cjasn.org.