Promoting Access to Renal Transplantation: The Role of Social Support Networks in Completing Pre-transplant Evaluations

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BACKGROUND: Completing pre-transplant evaluations may be a greater barrier to renal transplantation for blacks with end-stage renal disease (ESRD) than for whites.

OBJECTIVE: To determine whether social support networks facilitate completing the pre-transplant evaluation and reduce racial disparities in this aspect of care.

DESIGN, SETTING, AND PARTICIPANTS: We surveyed 742 black and white ESRD patients in four regional networks 9 months after they initiated dialysis in 1996 and 1997. Patients reported instrumental support networks (number of friends or family to help with daily activities), emotional support networks (number of friends or family available for counsel on personal problems) and dialysis center support (support from dialysis center staff and patients). The completion of pre-transplant evaluations, including preoperative risk stratification and testing, was determined by medical record reviews.

OUTCOME MEASUREMENT: Complete renal pre-transplant evaluations.

RESULTS: Compared to patients with low levels of instrumental support, those with high levels were more likely to have complete evaluations (25% versus 46%, respectively, $p < .001$). In adjusted analyses, high levels of instrumental support were associated with higher rates of complete evaluations among black women ($p < .05$), white women ($p < .05$), and white men ($p < .05$), but not black men. Among black men, but not other groups, private insurance was a significant predictor of complete evaluations.

CONCLUSIONS: Instrumental support networks may facilitate completing renal pre-transplant evaluations. Clinical interventions that supplement instrumental support should be evaluated to improve access to renal transplantation. Access to supplemental insurance may also promote complete evaluations for black patients.

KEY WORDS: racial disparities; social support networks; instrumental support; renal transplantation; pre-transplant evaluation.

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INTRODUCTION

Racial disparities in procedure utilization have been well documented across many diseases.^{1–3} Understanding why disparities exist is critical to promote equitable access to life-saving technologies. Renal transplantation is an important procedure in which to examine racial disparities because in clinically appropriate patients, transplantation prolongs survival and improves quality of life relative to remaining on dialysis.^{4,5} Black patients are less likely than white patients, however, to be placed on waiting lists and receive renal transplants.^{2,6}

The pre-transplant evaluation is increasingly recognized as a barrier to renal transplantation among women, the poor, and minority groups.^{2,7–9} Although patients generally prefer transplantation when this option is presented, a growing literature suggests that compared to whites, blacks with end-stage renal disease (ESRD) are less likely to complete a pre-transplant evaluation, and consequently, are less likely to proceed to transplantation.^{2,9–11} Completing the pre-transplant evaluation may be a challenging process for those with multiple clinical and social risk factors. The evaluation potentially requires testing for cardiovascular risk, cancer screening, and substance abuse counseling, among other steps.^{12,13} Prior investigations suggest factors such as patients' lack of knowledge about pre-transplantation processes, systems factors such as access to care, or provider bias in presenting transplantation options may present barriers.^{7,14} However, little research exists to guide strategies to foster completing the evaluation, and reduce racial disparities in this process. Studies of the pre-transplant evaluation period propose a role for social support networks in providing information needed by candidates to advance through the evaluation.^{9,15} To date, social support networks have not been fully evaluated as potentially enabling factors in completing pre-transplant evaluations.

Our study had two main objectives. First, we assessed the role of social support networks in fostering a complete evaluation for renal transplantation. Second, we evaluated differences in social support networks as potential contributors to racial

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disparities in completing pre-transplant evaluations. Understanding barriers and enabling factors may offer opportunities to reduce related disparities in access to transplantation.

METHODS

Study Cohort

Study participants were a random sample, stratified by race and sex, of patients aged 18 to 54 years who initiated dialysis for ESRD during 1996 and 1997. Subjects were identified through collaborating ESRD Networks in Alabama, southern California, Michigan, and the mid-Atlantic region including Maryland, Virginia, and the District of Columbia. Patient enrollment and data collection procedures have been previously described.^{2,10,16} Briefly, patients completed a telephone survey approximately 9 months after initiating dialysis. Of 1,679 eligible patients, 1,392 (82.9%) agreed to be interviewed. Non-respondents did not differ from respondents by race, gender, age, region of residence, primary cause of renal failure, or type of dialysis ($P > .12$ for all comparisons).⁷ Of 1,392 respondents, 1,169 (83.9%) had medical records that could be obtained for review. This study protocol was approved by the Health Care Financing Administration, and Human Studies Committees of Harvard Medical School and the Harvard School of Public Health.

Assessment of Complete Pre-transplant Evaluations and Transplant Appropriateness

Medical records for each participant were reviewed by trained staff of each ESRD Network to rate patients' clinical appropriateness for transplantation, based on their pre-transplant evaluation data.²

The appropriateness criteria were based on systematic literature reviews, interviews with clinical experts, and published guidelines on essential elements of evaluations for renal transplantation. An independent panel of nephrologists and transplant surgeons from academic and nonacademic centers also reviewed these data through a modified Delphi process to establish the criteria.² Patients with complete pre-transplant evaluations were rated for their appropriateness for transplantation.

Complete evaluations assessed critical contraindications to transplantation such as recent malignancy, active infection, or severe congestive heart failure, as well as relative contraindications, including obesity (body mass index [BMI] between 30 to 35). The full list of appropriateness criteria has been previously published.² The evaluation was diagnosis-specific and included indicated diagnostic procedures for surgical risk, noninvasive tests for patients with known coronary artery disease, testing for infections that would preclude immunosuppression, including active HIV infection, and screening and counseling for patients with prior substance abuse.^{2,16}

This study analyzed data from 742 patients without critical contraindications to transplantation. Patients were rated as appropriate for transplantation if their pre-transplant evaluations documented no critical or relative contraindications to transplantation. Patients with 1 or 2 relative contraindications were rated as "equivocal" candidates, and are included in the

present analyses. We have previously reported that patients with "equivocal" ratings have high rates of referral, wait list placement, and renal transplantation; thus, these "equivocal" participants were included.² Patients were categorized as having incomplete evaluations if they lacked necessary elements to rate their appropriateness for transplantation; these patients served as the reference group to test effects of social support networks on completing the evaluation. Patients deemed inappropriate for transplantation because of 1 or more critical contraindications or 3 or more relative contraindications to transplantation were excluded from the analysis.

Patient Survey

Patients were interviewed by telephone to assess their preferences for renal transplantation and to collect information on other factors that may influence access to transplantation. The survey measured patients' social support with single items in three domains (see Appendix): (1) *instrumental support networks* were assessed as the number of close friends or family that could help with daily activities in the home, (2) *emotional support networks* were assessed as the number of close friends or family available for counsel on personal problems, and (3) *dialysis center staff and patient support* was measured as the degree to which staff and patients at the dialysis center served as important sources of support. Based on the numbers of persons reported to provide instrumental and emotional support we categorized respondents in tertiles as having "high," "medium," or "low" support. The survey asked patients to rate support from dialysis center staff and patients as "not important," "somewhat important," or "very important."

In addition to assessing social support, the survey ascertained information regarding: socioeconomic status and resources (education, income, insurance status, and automobile ownership); physician recommendations for transplantation (whether any physician recommended the option of transplantation, or recommended against transplantation); patient preferences regarding transplantation; marital status; social demands (whether patients assumed primary care-taking for friends or family); the presence of comorbid conditions (coronary heart disease, congestive heart failure, and obesity); and the burden of kidney disease on patients' quality of life (from the Kidney Disease Quality of Life instrument).¹⁷

Statistical Analysis

Associations between patient characteristics, including social support networks, and completing pre-transplantation evaluations were estimated using Student's *t* test for continuous variables and Pearson's chi-square test for categorical variables. We performed Fisher's exact test for comparisons of categorical variables with small cell sizes. We report 2-tailed *p* values for all descriptive analyses.

We analyzed sequential multivariable logistic regression models to estimate effects of social support networks on the likelihood of having a complete evaluation, adjusting for potential confounders. Statistical interaction terms between race, gender, and instrumental support were tested, and effects of social support networks were estimated within strata of race and sex to assess race and gender differences in the effects of social support networks.

In multivariable models, item nonresponse led to missing data representing 10–23% of the sample for variables measuring income (10%), dialysis center staff and patient support (23%), and physician recommendations (12%). Missing data on covariates in multivariable models were imputed with multiple imputation via the SAS® procedure PROC MI.¹⁸ Multiple imputation methods provide unbiased estimates, and better precision than listwise deletion.¹⁸ We performed sensitivity analyses excluding imputed data from regression analyses to ensure the direction and magnitude of effect sizes were preserved qualitatively with and without the imputed values. We report adjusted odds ratios with 95% confidence intervals from regression models with imputed values from the PROC MI procedure. All analyses were conducted in SAS® Version 9.1.

RESULTS

Patient Characteristics

Table 1 shows the baseline cohort characteristics by race and gender. Compared to whites, blacks had lower incomes and were less likely to have supplemental private health insurance. Blacks were less likely than whites to have a physician recommend a renal transplant.

Black men had lower educational attainment, and less frequently expressed a preference for transplantation compared to white men. Black men were more likely to perceive racial discrimination in their medical care than white men, although this was not statistically significant.

Table 1. Patient Characteristics: By Race and Sex*

	Black women N=189	White women N=184	P Value	Black men N=185	White men N=184	P Value
Age, mean (SD), years	40.9 (9.0)	41.5 (9.2)	0.53	40.9 (8.9)	40.3 (9.0)	0.47
Region [‡]						
Alabama	38 (20)	40 (22)	0.70	46 (25)	48 (26)	0.79
Michigan	50 (26)	56 (30)	0.39	38 (21)	47 (26)	0.25
Mid-Atlantic region	58 (31)	51 (28)	0.53	65 (35)	49 (27)	0.08
Southern California	43 (23)	37 (20)	0.53	36 (19)	40 (22)	0.59
Annual income [‡]			< .001†			< .001
< \$20,000	96 (58)	46 (28)		77 (46)	55 (32)	
\$20,000–\$59,999	60 (36)	78 (47)		73 (44)	78 (45)	
≥\$60,000	9 (5)	43 (26)		16 (10)	40 (23)	
Educational attainment			0.06			0.04
< HS	46 (24)	27 (15)		50 (27)	32 (17)	
High school grad	69 (37)	72 (39)		67 (36)	65 (35)	
Some college	74 (39)	85 (46)		68 (37)	87 (47)	
Supplemental private insurance [§]	70 (37)	133 (72)	< .001	74 (40)	112 (62)	< .001
Owens an automobile	123 (65)	173 (94)	< .001	163 (88)	172 (93)	0.07
Preferences						
Wants a transplant	155 (82)	153 (83)	0.77	151 (82)	168 (91)	0.01
Very certain about preference [‡]	125 (77)	118 (84)	0.25†	117 (80)	118 (86)	0.27†
Physician recommendation						
Recommends transplant	122 (67)	120 (78)	0.02	118 (69)	117 (80)	0.03
Recommends against transplant	5 (3)	10 (7)	0.11†	2 (1)	7 (5)	0.09†
Social support [‡]						
Instrumental support network			0.15			0.32
Lowest tertile (0–1 contacts)	51 (28)	51 (28)		65 (36)	54 (30)	
Middle tertile (2–5 contacts)	91 (49)	75 (41)		70 (38)	83 (46)	
Highest tertile (≥ 6 contacts)	43 (23)	58 (32)		47 (26)	43 (24)	
Emotional support network			0.03			0.78
Lowest tertile (0–2 contacts)	80 (43)	55 (30)		57 (31)	58 (32)	
Middle tertile (3–6 contacts)	62 (34)	70 (38)		74 (41)	68 (38)	
Highest tertile (≥ 7 contacts)	43 (23)	58 (32)		50 (28)	55 (30)	
Importance of dialysis center staff and patient support			0.34			0.48
Not important	19 (12)	17 (14)		19 (12)	23 (16)	
Somewhat important	51 (33)	47 (40)		56 (36)	53 (38)	
Very important	86 (55)	55 (46)		80 (52)	64 (46)	
Married	63 (34)	117 (64)	< .001	95 (51)	102 (55)	0.43
Perceives racial discrimination in medical care	6 (3)	2 (1)	0.28†	11 (6)	4 (2)	0.07†
Health conditions						
Obese (BMI ≥ 30)	53 (29)	34 (19)	0.03	37 (20)	32 (18)	0.57
Congestive heart failure	9 (5)	8 (4)	0.85	10 (5)	10 (5)	0.99
Coronary heart disease	4 (2)	6 (3)	0.54†	6 (3)	8 (4)	0.60†
Burden of kidney disease in daily life score (KDQOL), mean, (SD),	33 (24)	35 (23)	0.51	38 (24)	36 (24)	0.40

*Student's *t* test or Pearson's chi-square test used to test racial differences between blacks and whites by sex. Data are presented as No. (%) unless otherwise indicated.

†Fisher's exact test used for categorical variables with small observations in cells.

‡Numbers may not sum to total because some survey data were missing, and percentages may not sum to total because of rounding.

§Includes those with Medicare or Medicaid insurance.

|| Burden of kidney disease is derived from the Kidney Disease Quality of Life instrument (KDQOL) and is scored from 0 (heaviest burden) to 100 (lightest burden).

Black women were less likely than white women to be married or own an automobile. Black women were more frequently obese than white women.

Black women reported smaller emotional support networks than white women. Whites and blacks were similar in the level of instrumental and dialysis center staff and patient support they reported (Table 1).

Social Support Networks and Completion of Pre-transplant Evaluations

Table 2 shows the unadjusted correlation between social support networks and completing the pre-transplant evaluation. Increasing levels of *instrumental* support networks were associated with a higher likelihood of having a complete pre-transplant evaluation. Among those with low instrumental support networks (0 or 1 social contact who could be called on for help with daily activities), 25% completed the evaluation compared to 46% of participants with high instrumental support networks (6 or more contacts), ($p < .001$). Emotional support networks were not a significant correlate of completing the evaluation in the full cohort ($p = .11$). Among those with low emotional support networks (0 to 2 contacts), 29% completed the evaluation, compared to 38% with high emotional support networks (7 or more contacts).

In contrast, those who viewed dialysis center staff and patient support as important were less likely to complete the pre-transplant evaluation. Among those rating dialysis center staff and patient support as “not important,” 43% completed

the evaluation, compared to 28% of those who viewed such support as “very important” ($p = .03$).

Table 2 shows unadjusted effects of social support networks stratified by race and sex. Increasing instrumental support networks was a strong predictor of completing the pre-transplant evaluation in all race and sex strata except black men (Table 2). No statistically significant effect of support from dialysis center staff and patients was observed within subgroups of race or sex, although a trend toward *decreasing* the likelihood of complete evaluations was observed.

Adjusted Predictors of Complete Evaluations

Adjusting for covariates, greater instrumental social support networks were strong predictors of completing the evaluation (Table 3). Emotional support networks and dialysis center staff and patient support were not statistically significant predictors in the adjusted model (Table 3).

Having a physician recommend transplantation, and expressing a preference for transplantation facilitated completion of the pre-transplant evaluation in the full cohort. Factors that reduced the likelihood of completing the evaluation included older age, and the geographic region of the referral network (Alabama, Michigan, and southern California, compared to the mid-Atlantic states).

Racial Disparities in Completing Evaluations

Neither social support networks nor other studied covariates fully explained racial disparities in completing the pre-transplant evaluation; black race continued to reduce the likelihood of completing the evaluation when other confounders were considered (Table 3). No tests of statistical interaction effects of race and gender with instrumental support were statistically significant (data not shown).

The adjusted effects of instrumental support networks and statistically significant covariates are shown by race and sex in Table 4. Among black men, instrumental support did not promote complete evaluations; instead, other covariates including private insurance, and having a physician recommend transplantation fostered complete evaluations.

Sensitivity Analyses with Listwise Deletion

To evaluate the effect of missing data, we repeated the regression analyses using listwise deletion, rather than multiple imputation, by including only patients with complete data on all survey items ($n = 386$, data not shown). With listwise deletion, neither the association with instrumental support nor the association with race on completing the pre-transplant evaluation was statistically significant. The qualitative direction and magnitude of findings remained the same.

In race and gender subgroups with complete data (i.e., using listwise deletion to handle item non-response, $n = 97$ white men, $n = 122$ black men, $n = 89$ white women, $n = 129$ black women), the protective effect of instrumental support was only statistically significant among black women (data not shown). Among white men, the protective trend of instrumental support was not seen. The qualitative findings were the same in the other subgroups.

Table 2. Percent of Patients with Complete Pre-transplant Evaluations by Race, Sex, and Levels of Social Support*

	All Patients N=742	Black women N=189	White women N=184	Black men N=185	White men N=184
Instrumental support network					
P Value	< .001	.05†	.01	.25	.02
Lowest tertile (0–1 contacts)	25	16	31	25	28
Middle tertile (2–5 contacts)	32	30	33	16	48
Highest tertile (≥ 6 contacts)	46	37	60	28	53
Emotional support network					
P Value	.11	.39	.08	.06†	.70
Lowest tertile (0–2 contacts)	29	25	35	12	47
Middle tertile (3–6 contacts)	35	34	37	28	40
Highest tertile (≥ 7 contacts)	38	23	53	26	45
Dialysis center support					
P Value	.03	.89	.31	.14	.63
Not important	42	32	53	32	52
Somewhat important	37	29	40	29	49
Very important	28	27	33	16	42

*Pearson's chi-squared analyses test associations between social support and completing the evaluation.

†Fisher's exact test used for comparisons with small observations within cells.

Table 3. Adjusted Odds of Completing the Pre-transplantation Evaluation*†

	Odds Ratios (95% Confidence Intervals)		
	I	II	III
Black race†	0.44 (0.32–0.60)	0.45 (0.33–0.63)	0.54 (0.37–0.78)
Women†	1.11 (0.81–1.53)	1.08 (0.78–1.50)	1.18 (0.83–1.67)
Age ‡	0.95 (0.93–0.97)	0.96 (0.94–0.97)	0.96 (0.94–0.98)
Instrumental support networks§		1.49 (1.17–1.90)	1.45 (1.11–1.90)
Emotional support networks§		1.01 (0.80–1.26)	0.95 (0.75–1.21)
Dialysis center staff and patient support§		0.76 (0.58–0.98)	0.79 (0.59–1.04)
Married†			1.13 (0.77–1.66)
Private health insurance†			1.24 (0.81–1.90)
Annual Household Income†			
<\$20,000			1.03 (0.53–1.99)
\$20,000–\$59,999			1.12 (0.65–1.91)
Educational attainment†			
< HS education			0.94 (0.55–1.60)
High school graduate			0.78 (0.52–1.16)
Automobile ownership			1.30 (0.73–2.31)
Region†			
Alabama			0.54 (0.33–0.88)
Michigan			0.45 (0.28–0.72)
Southern California			0.49 (0.30–0.81)
Preferences			
Wants a kidney transplant†			5.06 (2.31–11.07)
Physician recommendations			
Recommends transplantation†			2.09 (1.21–3.60)
Recommends against transplantation†			0.78 (0.22–2.75)
Perceives racial discrimination in medical care			0.27 (0.06–1.30)
Health conditions			
Coronary artery disease			0.47 (0.12–1.82)
Congestive heart failure			0.60 (0.22–1.68)
Obese BMI > 30			0.85 (0.55–1.32)
Burden of kidney disease in daily life score (KDQOL) ‡			1.00 (0.99–1.01)

*Sequential models include: I) 742 patients without absolute contraindications to transplantation; II) Logistic regression models effects of social support on completing the pre-transplant evaluation, adjusted for listed covariates; III) Logistic regression models completing the pre-transplant evaluation fully adjusted for listed covariates. Missing data imputed with multiple imputation in logistic regression models.

†Reference groups: white race; men; ≥ \$60,000; > high school education; unmarried (single, widowed, or divorced); lack of private insurance, reference group includes access to Medicare or Medicaid insurance; mid-Atlantic states; preferences reference group includes “don’t know”; no physician recommends transplantation; no physician recommends against transplantation.

‡Age and burden of kidney disease are modeled as continuous variables.

§Social support variables modeled as ordinal from least to highest level of support received.

DISCUSSION

Our study found that having greater instrumental social support networks were strongly associated with completing the pre-transplant evaluation among black women, white

women, and white men but not black men. Perceiving that support from dialysis center staff and patients was important was associated with a lower probability of completing the pre-transplant evaluation, although the findings were not statistically significant in multivariate analyses in any group.

Table 4. Adjusted Odds of Completing the Pre-transplant Evaluation by Race and Sex: Effects of Social Support Networks and Covariates (Odds Ratios (95% Confidence Intervals))*†

	Black Women	White Women	Black Men	White Men
Instrumental support	2.12 (1.12–4.00)	1.84 (1.10–3.11)	0.72 (0.36–1.44)	1.77 (1.06–2.97)
Emotional support	0.80 (0.47–1.37)	1.05 (0.65–1.71)	1.83 (0.93–3.57)	0.71 (0.46–1.11)
Dialysis center staff and patient support	0.78 (0.40–1.52)	0.66 (0.35–1.22)	0.61 (0.30–1.22)	1.12 (0.66–1.89)
Age	0.95 (0.91–0.99)	0.96 (0.92–1.00)	0.94 (0.88–0.99)	0.94 (0.90–0.98)
Private insurance	1.10 (0.42–2.87)	0.85 (0.33–2.18)	2.53 (1.01–6.37)	1.35 (0.55–3.32)
Physician recommends transplantation	4.07 (1.46–11.34)	2.48 (0.74–8.33)	4.19 (1.18–14.87)	1.72 (0.58–5.06)
Geographic region				
Alabama	1.02 (0.36–2.86)	0.62 (0.24–1.63)	0.42 (0.14–1.28)	0.40 (0.15–1.06)
Michigan	0.50 (0.18–1.40)	0.58 (0.24–1.37)	0.15 (0.04–0.58)	0.58 (0.23–1.47)
Southern California	0.70 (0.26–1.93)	0.71 (0.26–1.92)	0.18 (0.05–0.62)	0.32 (0.12–0.88)

*Multivariable logistic regression models of completing the pre-transplant evaluation, adjusting for household income, educational attainment, marital status, car ownership, heart disease, and burden of kidney disease (KDQOL). Results reported with missing data imputed with multiple imputation. Statistically significant comparisons where $p < .05$ in bold.

†Reference groups: lack of private insurance (includes access to Medicare or Medicaid insurance); no physician recommends transplantation; Mid-Atlantic states. Age as continuous variable.

Although instrumental social support networks strongly influence completing pre-transplant evaluations in most groups, we found no evidence to suggest they account for racial disparities in completing evaluations.

Prior research has underscored the importance of completing pre-transplant evaluations to facilitate access to transplantation.^{2,9,11} We have previously reported that patients with incomplete pre-transplant evaluations have a low probability of being placed on renal transplant wait lists and receiving transplants.² Our present findings suggest instrumental social support networks are important to completing this crucial step toward transplantation for many groups.

Previous work suggests social support networks provide information to guide candidates through steps required to access transplantation, and that this function of support networks may promote access to transplantation.¹⁵ Our finding that *instrumental* support improves the likelihood of completing a pre-transplant evaluation indicates broader functions for social support networks, apart from providing education and information. It is possible that having help with instrumental tasks (cooking, cleaning, or child care) may free time and energy to help candidates pursue diagnostic evaluations. Moreover, people assisting in these roles may help patients schedule and keep appointments, or help patients navigate complex health system issues. In other disease models, instrumental support has been associated with better functional status, and improved survival.¹⁹ The potential health promoting benefit of instrumental support networks may also help ESRD patients maintain functioning needed to complete pre-transplant evaluations.

We found that patients who rated social support from dialysis center staff and patients as very important were less likely to complete the pre-transplant evaluation. Patients who identify dialysis center staff and patients as important sources of support may face a trade-off, where transplantation leads to losing valued relationships that are not readily replaced by other available social ties. More research is needed to characterize the dimensions of support provided by dialysis center staff and patients, to determine strategies to optimize quality of life and access to care among patients who value these relationships.

Although instrumental social support networks were associated with completing pre-transplant evaluations, support networks did not account for racial *disparities* in this process. We measured other factors thought to be likely causes of disparities in procedure utilization, including patients' comorbid conditions, socioeconomic resources, private health insurance, geographic location, perceived discrimination in medical care, preferences for transplantation, and physicians' recommendations regarding transplantation. These factors, too, did not fully explain racial disparities in completing the pre-transplant evaluation, although supplemental private insurance may foster complete evaluations among black men. In addition, we find that blacks are less likely to receive recommendations to consider transplantation compared to whites. Physician recommendations were significant factors in promoting completed evaluations among both black men and women. Our data cannot completely discern whether physician recommendations were influenced by unmeasured clinical factors. Thus, further research should examine the nature of physician-patient communication in this setting to strengthen the role clinicians play in informing black patients

about renal replacement options in clinically appropriate contexts.

The strengths of our study included the ability to evaluate multiple dimensions of social support. Also, we were able to assess the relative contributions of several common factors thought to explain racial disparities in procedure utilization.

Our study has limitations. First, we are unable to draw causal inferences because of its cross-sectional design. Our findings suggest a need for randomized interventions to assess the causal impact of support networks on access to renal transplantation. Second, we have measured social support networks with a single item in each domain. It is possible that some participants may have received support from other sources besides friends and family (e.g., case managers, spiritual counselors). Future research should measure other sources of support that may have cultural relevance, such as churches and barber shops, particularly among black men.^{20,21} Other barriers not studied here may also contribute to racial disparities in completing pre-transplantation evaluations such as logistical barriers (distance from diagnostic testing centers, limited clinical office hours), perceived disrespect in interactions with medical providers and staff that may impede pursuing evaluations, and patients' cultural or religious beliefs.²²⁻²⁴ Finally, whereas our overall sample size was substantial, the numbers of patients in the race and gender strata were smaller, and survey item-nonresponse gave us limited precision, especially for multivariate analyses. We used multiple imputation to provide greater precision to estimate coefficients and confidence intervals.

In summary, we conclude that instrumental social support networks are important contributors to completing the renal pre-transplant evaluation among many ESRD patients. Future studies of instrumental social support interventions that could be provided in clinical settings, such as patient navigation, or clinic-sponsored peer groups, may provide areas for improvement in clinical practice.^{25,26}

Ultimately, a multifaceted approach that addresses multiple steps of the transplantation process is needed to reduce disparities in renal transplantation.^{27,28} To this end, enhancing social support networks and connecting patients to instrumental support in end-stage renal disease may be an important step to improve access to transplantation among many vulnerable groups.

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REFERENCES

1. **Smedley B, Stith AY, Nelson AR, eds.** Unequal Treatment: Confronting Racial and Ethnic Disparities in Health Care. Washington DC: The National Academies Press, 2003.
2. **Epstein AM, Ayanian JZ, Keogh JH, et al.** Racial disparities in access to renal transplantation—clinically appropriate or due to underuse or overuse? *N Engl J Med.* 2000;343(21):1537–44.
3. **Peterson ED, Shaw LK, DeLong ER, Pryor DB, Califf RM, Mark DB.** Racial variation in the use of coronary-revascularization procedures. Are the differences real? Do they matter? *N Engl J Med.* 1997;336(7):480–6.
4. **Cameron JI, Whiteside C, Katz J, Devins GM.** Differences in quality of life across renal replacement therapies: a meta-analytic comparison. *Am J Kidney Dis.* 2000;35(4):629–37.
5. **Wolfe RA, Ashby VB, Milford EL, et al.** Comparison of mortality in all patients on dialysis, patients on dialysis awaiting transplantation, and recipients of a first cadaveric transplant. *N Engl J Med.* 1999;341(23):1725–30.
6. **Eggers PW.** Racial differences in access to kidney transplantation. *Health Care Financ Rev.* 1995;17(2):89–103.
7. **Alexander GC, Sehgal AR.** Barriers to cadaveric renal transplantation among blacks, women, and the poor. *JAMA.* 1998;280(13):1148–52.
8. **Gaylin DS, Held PJ, Port FK, Hunsicker LG, Wolfe RA, Kahan BD, et al.** The impact of comorbid and sociodemographic factors on access to renal transplantation. *JAMA.* 1993;269(5):603–8.
9. **Weng FL, Joffe MM, Feldman HI, Mange KC.** Rates of completion of the medical evaluation for renal transplantation. *Am J Kidney Dis.* 2005;46(4):734–45.
10. **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.* 1999;341(22):1661–9.
11. **Alexander GC, Sehgal AR.** Why hemodialysis patients fail to complete the transplantation process. *Am J Kidney Dis.* 2001;37(2):321–8.
12. **Kasiske BL, Cangro CB, Hariharan S, et al.** The evaluation of renal transplantation candidates: clinical practice guidelines. *Am J Transplant.* 2001;1(Suppl 2):3–95.
13. **Steinman TI, Becker BN, Frost AE, Olthoff KM, Smart FW, Suki WN, et al.** Guidelines for the referral and management of patients eligible for solid organ transplantation. *Transplantation.* 2001;71(9):1189–204.
14. **Ayanian JZ, Cleary PD, Keogh JH, Noonan SJ, David-Kasdan JA, Epstein AM.** Physicians' beliefs about racial differences in referral for renal transplantation. *Am J Kidney Dis.* 2004;43(2):350–7.
15. **Arthur T.** The role of social networks: a novel hypothesis to explain the phenomenon of racial disparity in kidney transplantation. *Am J Kidney Dis.* 2002;40(4):678–81.
16. **Hicks LS, Cleary PD, Epstein AM, Ayanian JZ.** Differences in health-related quality of life and treatment preferences among black and white patients with end-stage renal disease. *Qual Life Res.* 2004;13(6):1129–37.
17. **Hays RD, Kallich JD, Mapes DL, Coons SJ, Carter WB.** Development of the kidney disease quality of life (KDQOL) instrument. *Qual Life Res.* 1994;3(5):329–38.
18. **Donders AR, van der Heijden GJ, Stijnen T, Moons KG.** Review: a gentle introduction to imputation of missing values. *J Clin Epidemiol.* 2006;59(10):1087–91.
19. **Woloshin S, Schwartz LM, Tosteson AN, et al.** Perceived adequacy of tangible social support and health outcomes in patients with coronary artery disease. *J Gen Intern Med.* 1997;12(10):613–8.
20. **Becker G, Gates RJ, Newsom E.** Self-care among chronically ill African Americans: culture, health disparities, and health insurance status. *Am J Public Health.* 2004;94(12):2066–73.
21. **Centers for Disease Control and Prevention.** Kidney disease mortality—Michigan, 1989–2005. *Morb Mort Wkly Rep.* 2007;56(10):225–27.
22. **Grubbs V.** Good for harvest, bad for planting. *Health Aff. (Millwood).* 2007;26(1):232–7.
23. **Holley JL, McCauley C, Doherty B, Stackiewicz L, Johnson JP.** Patients' views in the choice of renal transplant. *Kidney Int.* 1996;49(2):494–8.
24. **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.* 2002;92(5):811–7.
25. **Dohan D, Schrag D.** Using navigators to improve care of underserved patients: current practices and approaches. *Cancer.* 2005;104(4):848–55.
26. **Patel SS, Peterson RA, Kimmel PL.** The impact of social support on end-stage renal disease. *Semin Dial.* 2005;18(2):98–102.
27. **Magee CC, Pascual M.** Update in renal transplantation. *Arch Intern Med.* 2004;164(13):1373–88.
28. **Young CJ, Gaston RS.** Renal transplantation in black Americans. *N Engl J Med.* 2000;343(21):1545–52.

APPENDIX. SOCIAL SUPPORT NETWORKS SURVEY QUESTIONS

Social Support Network	Survey Question
Instrumental	"How many close friends or family members could help you on a regular basis with daily activities in your home, such as cooking, cleaning, shopping, or child care?"
Emotional	"How many close friends or family members could you talk to about your personal problems?"
Dialysis Center Staff and Patients	"How important to you are the patients and staff at your dialysis center as a source of emotional support?"