



Referred Female Dialysis Patients are Equally Likely to Receive a Transplant

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Introduction and Objective

- Kidney transplantation continues to be the best option for treating kidney disease; as such, increasing transplant rates remains a high priority.
- However, variability in transplant access exists for certain patient populations. Several regional United States or small international studies have reported that female dialysis patients are less likely to be referred for transplant than male dialysis patients.¹⁻³
- Therefore, in this study, we sought to examine whether female patients experience similar inequity in the upstream transplant process after referral.

Methods

- This retrospective study used electronic health records and county-level indices of socioeconomic deprivation at the time of dialysis initiation at a kidney care organization in the United States.
- Individuals included in the study were those who initiated dialysis between July 2015 and June 2018, were 18-80 years old, began care with a kidney care organization within 30 days of first ever dialysis, and had been referred for transplant after dialysis initiation.
- Individuals with evidence of transplant or transplant evaluation/listing prior to dialysis initiation were excluded. Individuals were followed from date of first eligibility until June 30, 2022, or until censoring for death, transfer, withdrawal from dialysis, renal recovery, or loss to follow up.
- Outcomes included transplant waitlisting and receipt and were compared using time-to-event models.
- Models were adjusted for differences in demographic factors, comorbidities, laboratory values, and socioeconomic factors across exposure categories, as appropriate.

Results

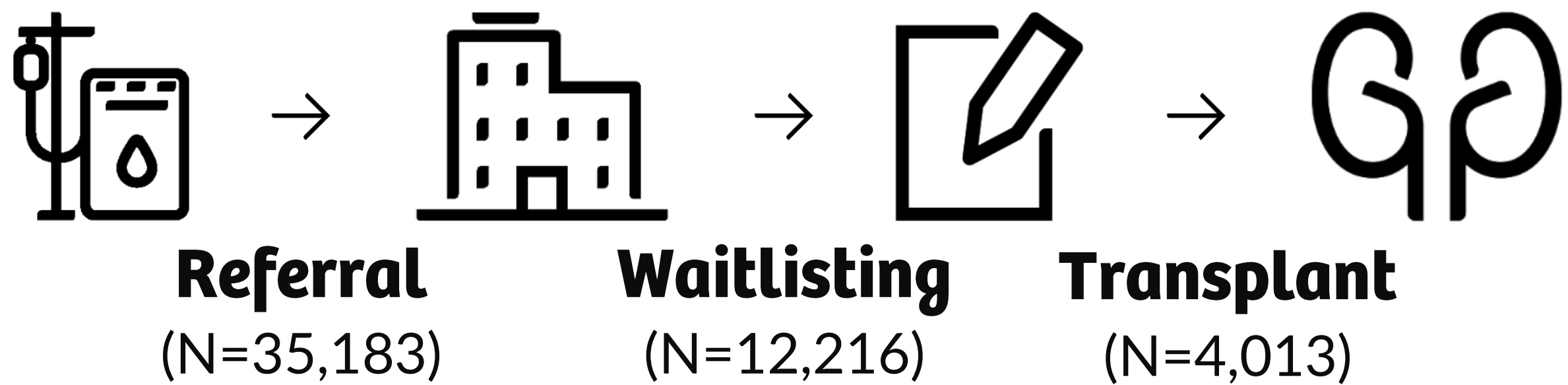
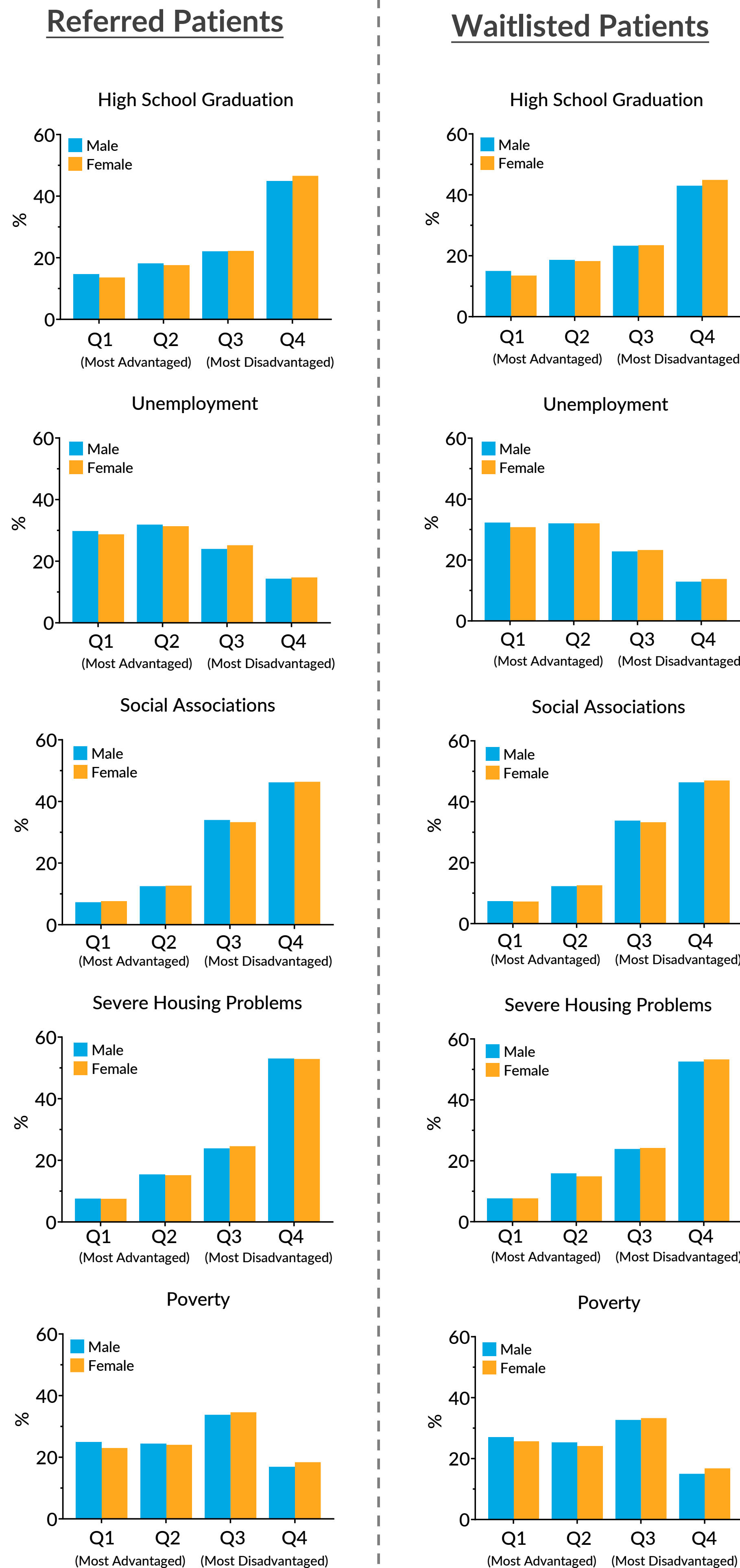


Table 1: Patient Characteristics

	Referred Patients		Waitlisted Patients	
	Male N = 21,395	Female N = 13,788	Male N = 7,709	Female N = 4,507
Age, years, mean ± SD	55.6 ± 12.6	55.7 ± 12.9	51.6 ± 12.7	51.5 ± 13.0
Race/Ethnicity, %				
Caucasian	34.8%	31.5%	32.6%	29.6%
African American	31.1%	36.8%	30.7%	36.5%
Hispanic	22.6%	20.5%	24.3%	21.5%
Asian	4.3%	4.1%	5.1%	5.5%
Other	7.2%	7.0%	7.2%	6.9%
BMI, kg/m ² , mean ± SD	28.4 ± 6.4	29.6 ± 7.8	28.4 ± 5.6	28.8 ± 6.7
Etiology of ESKD, %				
Diabetes	42.5%	44.1%	39.1%	37.5%
Hypertension	24.9%	21.7%	25.5%	23.2%
Other/Unknown	32.6%	34.2%	35.4%	39.3%
Modality/access, %				
HD/AVF	16.2%	14.2%	16.3%	15.0%
HD/AVG	1.9%	3.8%	1.6%	3.5%
HD/CVC	72.9%	72.5%	69.8%	67.7%
PD/HHD	9.0%	9.6%	12.3%	13.9%
Diabetes, %	74.7%	75.7%	68.9%	66.9%
CHF, %	1.4%	1.5%	1.0%	1.1%
CAD, %	9.0%	8.3%	9.0%	7.4%
CCI score, mean ± SD	4.5 ± 1.4	4.6 ± 1.4	4.1 ± 1.4	4.1 ± 1.4
Insurance, %				
Medicare	28.0%	24.3%	39.9%	35.7%
Medicaid	41.4%	44.4%	28.5%	32.3%
Commercial	25.9%	27.3%	26.3%	27.4%
Other	4.7%	4.1%	5.4%	4.5%
US Region*, %				
West (OPO 5 & 6)	25.5%	23.5%	25.9%	23.3%
Middle America (OPO 4 & 8)	17.6%	18.4%	17.3%	18.6%
Upper Midwest (OPO 7 & 10)	13.7%	14.4%	13.8%	15.1%
East (OPO 1, 2, 9, & 11)	26.2%	25.8%	26.2%	25.2%
Southeast (OPO 3)	17.1%	17.9%	16.6%	17.8%

AVF, arteriovenous fistula; AVG, arteriovenous grafts; BMI, body mass index; CCI, Charlson comorbidity index; CVC, central venous catheter; ESKD, end-stage kidney disease; HD, hemodialysis; OPO, organ procurement organization; PD, peritoneal dialysis
*West: AZ, CA, NM, NV, UT, AK, HI, ID, MT, OR, WA; Middle America: OK, TX, CO, IA, KS, MO, NE, WY; Upper Midwest: IL, MN, ND, SD, WI, IN, MI, OH; East: CT, MA, ME, NH, RI, VT, DC, DE, MD, NJ, WV, NY, KY, NC, SC, TN, VA; Southeast: AL, AR, FL, GA, LA, MS, PR.

Figure 1. Socioeconomic Factors



Socioeconomic status data derived from Robert Wood Johnson Foundation County Health rankings and US census data at the county level.

Table 2: Hazard Ratio Summary of Transplant Outcomes for Female Patients Relative to Male Patients

	Male	Female
Referred Patients	21,395	13,788
Likelihood of waitlisting Adjusted HR (95% CI) among referred patients	1.00 (ref)	0.93 (0.89, 0.96)
Likelihood of receiving transplant Adjusted HR (95% CI) among waitlisted patients Adjusted HR (95% CI) among all referred patients	1.00 (ref) 1.00 (ref)	1.07 (1.00, 1.14) 1.05 (0.98, 1.12)

Abbreviations: CI, confidence interval; HR, hazard ratio; ref, referent
Hazard ratios adjusted for age, BMI, etiology of ESKD, diabetes, Charlson comorbidity index score, high school graduation rate, unemployment rate, social associations, severe housing problems, and poverty rate. Transplant waitlisting and transplant receipt also adjusted for time on dialysis.

After adjusting for demographic and socioeconomic factors, compared to male patients, female patients are slightly less likely to be placed on a transplant waiting list after referral, but slightly more likely to receive a transplant after waitlisting. The net effect is that female patients referred for transplant were equally likely to receive a transplant compared to male counterparts.

Conclusions

- Females are equally likely to have a successful transplant and increasing referrals for female patients may be one possible solution to increase overall transplant numbers.

Limitations

- During this study period, the EHR did not distinguish between biological sex and gender identity.
- This was a retrospective, observational study; residual confounding exists and cannot be accounted for.

References and Acknowledgements

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