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Disparities in completion rates of the medical pre-renal transplant evaluation by race/ethnicity and gender

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Abstract

Background—A significant number of potential kidney transplant candidates do not complete the required medical evaluation after referral to a transplant program.

Methods—Factors associated with rate of completion of the renal transplant evaluation were analyzed using a retrospective chart review of patients first seen between October 1, 2009 and September 30, 2010 (n=256). The primary end point was completion in 12 months. Independent variables included socioeconomic, demographic, and medical factors.

Results—Mean age was 50.7 years; 49.6% were black, 28.5% Hispanic, and 21.9% white/other; 26.3% did not require dialysis. During follow-up, 23.4% did not complete the evaluation. Multivariable analysis indicated that slower rates of completion were associated with needing a greater number of medical tests (compared to 0–2: 3–5 tests, hazard ratio (HR)=0.65, p=0.02; 6 tests, HR=0.47, p=0.0005) and requiring >1 hospitalization (compared to none: HR=0.37, p=0.0008). A significant interaction between race/ethnicity and gender on completion was found: compared to black men, Hispanic men (HR=2.75, p<0.0001), Hispanic women (HR=1.96, p=0.006), and white men (HR=1.99, p=0.005) had more rapid completion. In comparison, black and white women (HR=1.38, p=0.16; HR=0.94, p=0.83, respectively) were not significantly different from black men in rates of completion. Differences by race/ethnicity and gender were not confounded by socioeconomic variables or social support.

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Conclusions—In order to lessen barriers and facilitate renal transplantation, black men and women, white women, and patients needing multiple medical tests and requiring several hospitalizations may benefit from additional assistance during the medical evaluation process.

Keywords

kidney transplantation; racial/ethnic disparities; gender differences; socioeconomic status; cohort study

Renal transplantation is the preferred treatment for end-stage renal disease (ESRD), as it has been shown to improve both quality of life and survival compared with ongoing dialysis (1,2), also to decrease the cost of care (3). In 2010, 16,849 renal transplants were performed in the United States (US), while 75,807 people remained on the waiting list at year's end (4). Inequity in access to transplantation has been well-documented. Minority race/ethnicity has been frequently found to confer a lower likelihood of transplantation (5–8) as has female gender (6,8). For example, a 1988 study found that non-white men 21–45 years old had less than half the chance of receiving a transplant compared with white men of the same age. Women aged 46–60 years old had less than half the chance of receiving a transplant compared with men of the same age, regardless of race (8). More than 20 years later, research demonstrated that even after adjustment for demographic, clinical and socioeconomic factors, blacks had a 59% lower rate of transplant than whites (5). Also, despite similar referral rates, Hispanics and Native Americans were also less likely to receive a renal transplant than whites (9).

Multiple factors, often inter-related, have been found to be associated with these racial/ethnic disparities. Socioeconomic factors play a role, for example a higher level of education has been associated with an increased likelihood of transplantation (10,11), while poverty is linked to a lower likelihood of receiving a transplant (6,12). In another study, patient preference was found to affect the likelihood of transplantation, with black patients less likely than whites to want a transplant (7). Physician beliefs may also influence the chance of transplantation. A survey of nephrologists found that physicians were less likely to believe that renal transplantation improves survival for black patients than for whites (13).

Studies have also looked at the individual steps in the transplant process, not just the final outcome of transplantation. These steps were initially described by Alexander & Seghal in 1998 (6) as the following: first, being medically suitable and possibly interested in transplantation; second, being definitely interested; third, completion of the pre-transplant medical evaluation; and lastly, being listed and awaiting transplant. Factors associated with a decreased likelihood of the third step, completing the transplant evaluation, included black race, female gender, poverty, older age, and diabetes as the cause of renal failure (6).

We sought to determine factors associated with completion of the medical evaluation in the University of Illinois at Chicago (UIC) renal transplant patient population, to identify barriers and potential interventions to facilitate patients being listed for transplant. As Hispanics comprise nearly one-third of Chicago's population (14; 2010 data) and have not been studied in the majority of previous research on steps in the transplant process (5,6,15–17), we included Hispanics as a distinct group. We also included pre-dialysis patients who

have rarely been included (18), as well as those with a previous renal transplant who are often excluded (6,9,15–18), to gain a broad picture of potential barriers to completion in the UIC patient population, which is representative of a typical inner-city teaching hospital. Specific medical tests requested by the transplant team were also examined to assess whether there is an area of particular difficulty that could be addressed to facilitate completion.

Results

The mean age of the sample was 50.7 years and 57.4% were men; 49.6% were black, 28.5% Hispanic, and 21.9% white/other (Table 1). A large percentage of the sample was unemployed (74.8%), while 42.7% were currently married. Primary insurance type included private (37.6%), Medicare (42.0%), and Medicaid (20.4%); 26.3% did not require dialysis.

Of the 256 patients, 60 (23.4%) did not complete the medical evaluation within 12 months of their initial visit. Reasons for non-completion were divided into three categories: patient choice not to continue the evaluation either at all or at UIC (26.7%), non-compliance (41.7%), and lost to follow-up (31.7%). No patients died during the 12 month follow-up period. Overall, of those who did complete the evaluation, 42.8% were black, 33.7% were Hispanic, and 23.5% were white/other (Table 2).

In unadjusted analysis (Table 2), there were no differences in the rates of completion according to age, gender, employment status, annual income based on zip code, or social support (all p -values >0.10). Differences in the rate of completion were found to be associated ($p = 0.10$) with race/ethnicity (compared to white/other, black hazard ratio (HR)=0.68, $p=0.04$; Hispanic HR=1.40, $p=0.08$; overall race/ethnicity $p<0.0001$), type of primary insurance (compared to private insurance, Medicare HR=0.68, $p=0.02$; Medicaid HR=0.82, $p=0.32$), and marital status (compared with married, single HR=0.74, $p=0.06$; divorced/widowed/separated HR=0.69, $p=0.05$).

Clinical variables associated with a slower rate of completion included (Table 2): being on dialysis for more than 12 months versus not on dialysis (HR=0.65, $p=0.02$), needing more than one hospitalization at UIC versus none (HR=0.40, $p=0.001$; Figure 1a), and requiring a greater number of tests (compared to 0–2: 3–5 tests HR=0.69, $p=0.04$; 6 tests HR=0.51, $p=0.001$; Figure 1b). Needing certain tests was associated with a slower rate of completion: stress test (HR=0.55, $p<0.0001$), lower extremity arterial studies (HR=0.58, $p=0.0004$), carotid duplex (HR=0.49, $p=0.002$), colonoscopy (HR=0.68, $p=0.02$), and Pap test for women (HR=0.56, $p=0.04$). Having failed to complete a pre-transplant evaluation at UIC in the past (HR=0.47, $p=0.05$) was also associated with a slower rate of completion. Clinical factors not associated with rate of completion included: depression, prior renal transplant, body mass index (BMI), diabetes, hypertension, coronary artery disease, peripheral arterial disease, offer of a living donor, requiring chest radiograph, pulmonary function tests, echocardiogram, renal ultrasound, cardiac catheterization, and mammogram.

Looking further at race/ethnicity given the disparity in rates of completion, there were differences between the groups in both socioeconomic and clinical characteristics (Table 3).

For example, compared with white/others (37.0%), significantly fewer blacks (24.2%) and Hispanics (18.1%) were working ($p=0.05$). White/others had a significantly higher median income for zip code (\$56,468) than either blacks (\$35,191, $p<0.0001$) or Hispanics (\$41,549, $p<0.0001$). While hypertension was very prevalent in all groups, significantly higher numbers were seen in blacks (97.6%) and Hispanics (95.9%) compared with white/other (82.1%, overall $p=0.0002$).

In multivariable analysis (Figure 2), variables that remained significantly associated with a slower rate of completion included requiring a greater number of tests (compared with 0–2: 3–5 tests $HR=0.65$, $p=0.02$; 6 tests $HR=0.47$, $p=0.0005$), and being hospitalized at UIC more than once (compared with none, $HR=0.37$, $p=0.0008$). Race/ethnicity was also associated with completion (overall $p<0.0001$), and there was a significant interaction found between race/ethnicity and gender on completion (interaction $p=0.02$; Figures 1c & 2). Compared to black men, Hispanic men ($HR=2.75$, $p<0.0001$), Hispanic women ($HR=1.96$, $p=0.006$), and white men ($HR=1.99$, $p=0.005$) had more rapid completion. In comparison, black and white women ($HR=1.38$, $p=0.16$; $HR=0.94$, $p=0.83$, respectively) were not significantly different from black men in rates of completion. Completion was not associated with the measures of socioeconomic status, depression, or social support that were included in this study, nor did they confound the association of race/ethnicity and gender with completion.

Looking only at the subgroup of women ($n=93$), similar to the combined model, a slower rate of completion was related to requiring a greater number of tests and being hospitalized at UIC more than once. Compared to white women, Hispanic women completed faster ($HR=2.18$, $p=0.02$), and there was a trend for black women to also complete at a faster rate ($HR=1.80$, $p=0.08$). In addition, a slower rate of completion was independently associated with needing a Pap test ($HR=0.52$, $p=0.01$).

Discussion

In this retrospective chart review, we examined demographic, socioeconomic and medical factors associated with completion of the pre-renal transplant medical evaluation, to identify markers that might indicate a need for support or intervention to complete the process. Not surprisingly, we found that requiring more testing or hospitalization(s) predisposed to slower rates of completion. This likely reflects additional time for additional tests and delay due to hospitalization; however these factors may also indicate poorer health of these patients whose comorbidities present barriers to completion. Compared with black men, Hispanic men had nearly a threefold, and white men and Hispanic women had a two-fold, faster completion, while black and white women were not significantly different from black men. These differences by race/ethnicity and gender were not accounted for by differences in socioeconomic, social support or medical factors measured in our study.

The majority of studies examining the medical evaluation step in the transplant process have compared blacks with whites (5,6,15–17), or blacks with non-blacks (18). Our finding that blacks are less likely to complete the pre-transplant evaluation compared with white/others is congruent with most of these studies (6,16–18).

The association of Hispanic ethnicity with faster completion is a new finding, as Hispanics have not routinely been included in previous studies of the transplant process. One previous study (9) comparing whites with Hispanics found no difference in the rates of completion of the pre-transplant evaluation (9). It is important to include Hispanics, not only because they are one of the fastest growing ethnic groups in the US (19), but also because they have a 1.5 times higher incidence of ESRD than non-Hispanics (4). In previous studies looking at medication compliance, no difference in adherence to anti-retroviral therapy was found between whites and Hispanics (20), while another found Hispanics were less likely to be adherent to antihypertensive regimens than whites (21). A study looking at racial/ethnic differences in appointment keeping for primary care found that Hispanics had twice the rate of missing appointments compared with whites (22). However, one study looking at compliance with Pap testing found Hispanic women were twice as likely to be compliant with guidelines as whites (23). This last study is concordant with our finding of increased compliance/completion in Hispanics. If we had included only blacks and whites, this faster completion would not have been seen. It is therefore important not only to include Hispanic patients, but to study minority groups separately. The explanations for the relative success of Hispanics at completing the evaluation may reflect social support or cultural factors not captured in this study. If the reasons for their faster completion can be further elucidated, it may benefit patients across racial/ethnic boundaries.

In this study, white and Hispanic men completed the medical evaluation more rapidly than white and Hispanic women, while there was no difference between black men and women. Previous studies looking at differences between genders in compliance have shown either no difference (antihypertensive medication after a stroke; 24), better adherence in men (medication compliance in Medicaid population; 25), or in women (self-care activities in diabetes; 26). The gender difference in completion seen in our study may potentially be explained by differences in caregiving behaviors. In one study, elderly disabled women received significantly less informal care than elderly disabled men. It was also found that disabled married women received significantly less spousal care than disabled married men; and even if disabled themselves, 20% of women (compared with 8% of men) were providing home care to their spouse (27). A recent longitudinal study (28) found that women with difficulty performing activities of daily living cared for by their husbands had more than three times the risk of having their care transitioned to another caregiver when compared to men in a similar situation. Women with ESRD in the current study may also be receiving less support from their caregivers and therefore complete the medical evaluation at a slower rate.

Women who required a Pap test as part of the pre-transplant evaluation had slower rates of completion. While this might simply be a function of adding an additional test, it is also possibly due to the test itself. One study showed that minority or low-income women have more misconceptions about the purpose (29), and therefore may be less likely to complete the test. The Centers for Disease Control and Prevention has also found downtrends in cervical cancer screening, either at all, or within the guidelines time, in young women of all race/ethnicities (30).

There are limitations to this study. The sample size may have lessened the power to detect additional independent associations with completion in multivariable models. This study also reflects the experience and patient population of a single transplant center, which may not be widely generalizable; however it likely reflects the populations of inner-city teaching hospitals. As it is a review of UIC medical records alone, hospitalizations or previous pre-transplant evaluations at other facilities would not have been available. Lastly, as a review of records, the data are dependent on the completeness of the documentation in the medical charts. Data on several variables (e.g., transportation, education, primary care physician, country of origin) were infrequently documented, and so could not be included.

In conclusion, significant racial/ethnic and gender disparities exist in the rates of completion of the pre-renal transplant medical evaluation. The lower likelihood of completion for blacks and females has been documented in some studies (though not yet fully explained), while the success of Hispanics in this area is a new finding. Cultural factors likely play an important role and deserve further study. In order to lessen barriers and facilitate renal transplantation, evaluating the processes of care regarding medical testing and assisting patients after hospitalization may be helpful to increase completion rates.

Materials and methods

Study and participants

This study was a retrospective review of medical records of adult patients presenting for an initial renal transplant evaluation at the UIC transplant clinic between October 1, 2009, and September 30, 2010. Of the 272 patients presenting during this period, 16 were excluded as they were less than 18 years old, leaving a final study sample of 256 patients. Data were extracted from the patients' UIC electronic medical record from their initial visit through either completion of their evaluation (defined by placement on the transplant wait list, receipt of a living donor transplant, or determined not a candidate), or a 12 month period of follow-up. At their initial visit, UIC transplant staff determines which additional medical tests are clinically indicated. In an effort to facilitate completion, patients are sent a printed schedule of their UIC appointments, receive reminder calls, and are contacted by the UIC transplant clinic staff to reschedule missed appointments. Translators are always used when necessary to ensure clear communication, and transportation is provided if needed. A few patients elect to pursue medical testing through their primary physician rather than at UIC. Vital status during the study period was confirmed by medical record review and the US Social Security Death Index (29). The institutional review board at UIC approved this chart review (IRB Protocol 2011-1072).

Variables

The variables collected included demographics (age, gender, race/ethnicity, marital status), as well as socioeconomic factors (employment status, type of primary insurance, and median income for residential zip code determined by US Census data (19)). Race/ethnicity was documented by the treating physician in the medical record. Due to smaller sample sizes for Asian (5.5%) and other (2.7%) races and their similar rates of completion to whites, these three groups were combined. If patients had more than one type of insurance, the one that

would primarily cover a renal transplant was designated as ‘primary’. Patients’ level of social support was documented in the social work evaluation of available family assistance and by patient report of having the offer of a living donor. Distance to the transplant center was estimated by grouping patients based on their zip code: Chicago proper, the five suburban collar-counties, and rural/out of state. Medical factors included major co-morbid conditions at the time of presentation (diabetes mellitus type 1 or 2, hypertension, coronary artery disease, peripheral arterial disease, and depression as noted in the medical history or the social work evaluation). Other medical information collected included height and weight to calculate BMI (kg/m²), history of a previous renal transplant, dialysis dependence, the duration of dialysis if required, hospitalization at UIC during the follow-up period, or having a previous incomplete transplant evaluation at UIC. The total number and individual tests required were noted: chest radiography, echocardiogram, non-invasive stress test, cardiac catheterization, renal ultrasound, lower extremity arterial studies, pulmonary function tests, carotid duplex, colonoscopy, and mammogram and Pap test for women. For those who did complete the evaluation, the date of being placed on the wait list, receiving a living donor transplant, or being determined not a candidate was noted. The main dependent variable was the rate of completion of the pre-transplant medical evaluation within 12 months from the initial renal transplant clinic visit.

Statistical analysis

All analyses were conducted with SAS (version 9.2; SAS Institute, Cary, NC). Means, standard deviations, medians, interquartile ranges, and percentages were used to describe the sample. Cox proportional hazard models were used to determine bivariate associations of the rate of completion with individual independent patient demographic, socioeconomic, and medical variables. Kaplan-Meier plots were made of select significant associations. Given the differences noted between racial/ethnic groups (black, Hispanic, and white/other) in the rate of completion, the associations of race/ethnicity with demographic, socioeconomic, and medical variables were also assessed, using the Chi-square or Mann-Whitney U tests.

Next, a multivariable Cox proportional hazards model for completion was built by entering all independent variables associated with completion or race/ethnicity (from the bivariate models at a p-value 0.10), and using backwards stepwise manual elimination to retain variables with a p-value <0.05. Categorical variables were also tested as binary (e.g., marital status). The final multivariable model was then examined for confounding by other independent variables associated with either completion or race/ethnicity (in the individual models at p-value 0.10), plus depression and level of social support; the regression coefficients did not substantially change. Lastly, potential effect modification of associations with completion by age, gender, race/ethnicity, employment status, primary insurance, income and marital status was assessed. Gender was found to significantly modify only the association of completion with race/ethnicity. A sensitivity analysis was performed by excluding the “other races” from whites (n=20) in the final multivariable model and the results did not change. The assumption of proportionality was tested in the final model by inclusion of time-dependent variables and stratification on the dependent variable; the proportionality assumption was met.

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Abbreviations

ESRD	end-stage renal disease
HR	hazard ratio
UIC	University of Illinois at Chicago

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Figure 1. Kaplan-Meier Plots of Factors Significantly Associated with Completion of the Medical Pre-Renal Transplant Evaluation. a) Number of required medical tests; b) Number of hospitalizations; c) Race/ethnicity and gender.

Figure 2.

Hazard Ratios for Factors Significantly Associated ($p < 0.05$) with Completion of the Medical Pre-Renal Transplant Evaluation from the Final Multivariable Model.

The bars plotted represent the log of the hazard ratio to account for the asymmetry of hazard ratios greater than and less than 1.0. Numbers next to the bars are the actual hazard ratios.

Tests=number of required medical tests; Hosp=number of hospitalizations; NHW=Non-Hispanic white

^a $p < 0.05$

^b $p < 0.01$

Table 1

Baseline Characteristics (n=256)

Variable	Value
Age (years)	50.7 (12.3)
Female gender	109 (42.6)
Race/ethnicity:	
Non-Hispanic white/other	56 (21.9)
Non-Hispanic black	127 (49.6)
Hispanic	73 (28.5)
Not employed	187 (74.8)
Primary insurance:	
Private	96 (37.6)
Medicare	107 (42.0)
Medicaid	52 (20.4)
Median annual income by zip-code (\$1,000)	41.0 (34.3, 56.5)
Marital status:	
Married	109 (42.7)
Single	93 (36.5)
Divorced/widowed/separated	53 (20.8)
Time on dialysis:	
Not on	63 (26.3)
12 months	96 (40.2)
>12 months	80 (33.5)
Had previous incomplete work-up	18 (7.0)

Values are mean (standard deviation), median (interquartile range), or n (%).

Sample sizes: employed, n=250; primary insurance, n=255; income, n=255; marital status, n=255; time on dialysis, n=239

Table 2

Bivariate Associations (p < 0.10) with Rate of Completion of the Medical Evaluation (n=256)

	Non-Completers (n=60)	Completers (n=196)	Hazard Ratio (p-value)	
<u>Demographics</u>				
Race/ethnicity:				(<0.0001) ^a
Non-Hispanic white/other	10 (16.7)	46 (23.5)	1.00	Ref.
Non-Hispanic black	43 (71.7)	84 (42.8)	0.68	(0.04)
Hispanic	7 (11.7)	66 (33.7)	1.40	(0.08)
Primary insurance:				(0.06) ^a
Private	14 (23.3)	82 (42.0)	1.00	Ref.
Medicare	32 (53.3)	75 (38.5)	0.68	(0.02)
Medicaid	14 (23.3)	38 (19.5)	0.82	(0.32)
Marital status:				(0.07) ^a
Married	16 (26.7)	93 (47.7)	1.00	Ref.
Single	28 (46.7)	65 (33.3)	0.74	(0.06)
Divorced/widowed/separated	16 (26.7)	37 (19.0)	0.69	(0.05)
<u>Clinical characteristics</u>				
Time on dialysis:				(0.07) ^a
Not on	7 (13.2)	56 (30.1)	1.00	Ref.
12 months	24 (45.3)	72 (38.7)	0.83	(0.29)
>12 months	22 (41.5)	58 (31.2)	0.65	(0.02)
Hospitalizations:				(0.005) ^a
None	47 (78.3)	165 (84.2)	1.00	Ref.
One	5 (8.3)	18 (9.2)	0.84	(0.48)
More than one	8 (13.3)	13 (6.6)	0.40	(0.001)
Had previous incomplete work-up:	10 (16.7)	8 (4.1)	0.47	(0.05)
Needs stress test:	24 (70.6)	109 (58.6)	0.55	(<0.0001)
Needs lower extremity arterial study:	34 (79.1)	123 (64.4)	0.58	(0.0004)
Needs carotid duplex:	12 (36.4)	23 (12.2)	0.49	(0.002)
Needs colonoscopy:	17 (34.0)	53 (29.0)	0.68	(0.02)
Number of tests needed:				(0.005) ^a
0–2	10 (18.9)	47 (24.1)	1.00	Ref.
3–5	29 (54.7)	101 (51.8)	0.69	(0.04)
6	14 (26.4)	47 (24.1)	0.51	(0.001)
Needs Pap test (women only):	14 (77.8)	40 (51.3)	0.56	(0.04)

Values are n (%) or hazard ratio (p-value).

^a p-value for overall effect.

Sample sizes: primary insurance, n=255; marital status, n=255; time on dialysis, n=239; stress test, n=220; lower extremity arterial study, n=234; carotid duplex, n=221; colonoscopy, n=233; number of tests, n=248; Pap test, n=96.

Variables tested but not significant: age, gender, employment, income, social support, estimated distance to UIC, depression, prior renal transplant, BMI, diabetes, hypertension, coronary artery disease, peripheral artery disease, living donor offered, chest radiograph, pulmonary function tests, echocardiogram, renal ultrasound, cardiac catheterization, and mammogram.

Table 3

Bivariate Associations (p 0.10) with Race/Ethnicity (n=256)

	Non-Hispanic black (n=127)	Hispanic (n=73)	Non-Hispanic white/other (n=56)	p-value ^a
<u>Demographics</u>				
Not employed:	94 (75.8)	59 (81.9)	34 (63.0)	0.05
Primary insurance:				
Private	36 (28.3)	26 (36.1)	34 (60.7)	0.001
Medicare	59 (46.5)	32 (44.4)	16 (28.6)	
Medicaid	32 (25.2)	14 (19.4)	6 (10.7)	
Median annual income by zip-code (\$1,000): ^b	35.2 (29.4, 48.4)	41.5 (35.5, 50.2)	56.5 (44.5, 65.8)	<0.0001
Marital status:				
Married	31 (24.6)	48 (65.8)	30 (53.6)	<0.0001
Single	63 (50.0)	10 (13.7)	20 (35.7)	
Divorced/widowed/separated	32 (25.4)	15 (20.5)	6 (10.7)	
<u>Clinical characteristics</u>				
Has diabetes:	57 (44.9)	45 (61.6)	22 (39.3)	0.02
Has hypertension:	124 (97.6)	70 (95.9)	46 (82.1)	0.0002
Has peripheral arterial disease:	5 (3.9)	0 (0)	4 (7.1)	0.09
Has living donor offered:	71 (71.0)	48 (80.0)	32 (61.5)	0.098
Needs pulmonary function tests:	20 (18.2)	3 (4.4)	10 (18.9)	0.02
Needs carotid duplex:	24 (23.3)	4 (5.9)	7 (14.0)	0.009
Needs echocardiogram:	52 (49.5)	23 (34.3)	14 (28.0)	0.02

Values are n (%) or median (interquartile range).

^a Chi-square or Mann-Whitney U test for comparison between groups.^b Black vs. white/other (p <0.0001), Hispanic vs. white/other (p <0.0001).

Sample sizes: employed, n=250; primary insurance, n=255; income, n=255; marital status, n=255; living donor offered, n=212; pulmonary function test, n=231; carotid duplex, n=221; echocardiogram, n=222.

Variables tested but not significant: age, gender, social support, depression, time on dialysis, prior renal transplant, hospitalizations, previous incomplete work-up, BMI, coronary artery disease, chest radiograph, stress test, lower extremity arterial study, colonoscopy, renal ultrasound, cardiac catheterization, number of tests needed, mammogram, and Pap test.