Predictors of Kidney Transplantation among Persons with End-Stage Renal Disease in Wisconsin

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INTRODUCTION

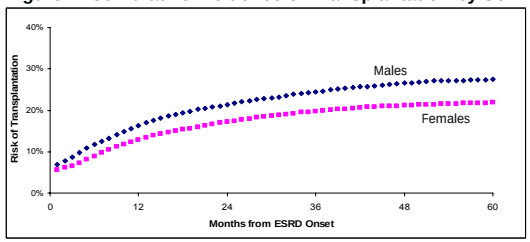
- The incidence of end-stage renal disease (ESRD) has increased over 3-fold from 1982 to 2005 in Wisconsin, which has dramatically increased the number of patients waiting for a kidney transplant.
- Compared to dialysis treatment, kidney transplantation is associated with an increase in life expectancy and quality of life and a decrease in health care costs.
- Inequalities in the acquisition of a kidney transplant have been documented for blacks, women, and low income groups.

The purpose of this study is to examine the significance of patient-level and community-level variables on the risk of kidney transplantation for patients with ESRD in Wisconsin.

METHODS

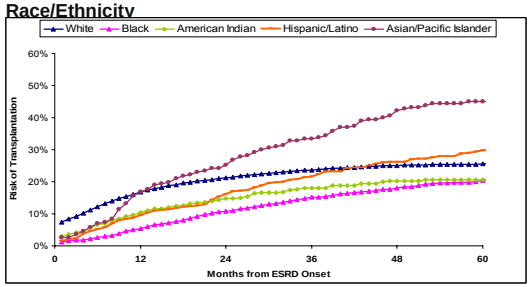
- The Renal Network of the Upper Midwest supplied de-identified information on incident cases of ESRD in Wisconsin from January 1, 1982 to October 30, 2005 (n=22,387).
- Patient-level variables included: age, primary diagnosis, sex, and race/ethnicity.
- Median household income and education level were obtained from the 1990 US Census and merged with the patients' zip code of residence by the Renal Network.
- Computer software ArcGIS 9.0 was used to calculate the distance from the nearest dialysis center to each patient's zip code of residence.
- Competing risk and Cox proportional hazards analyses were used to explore the relationship between patient characteristics and kidney transplantation.

Figure 1: Cumulative Incidence of Transplantation by Sex



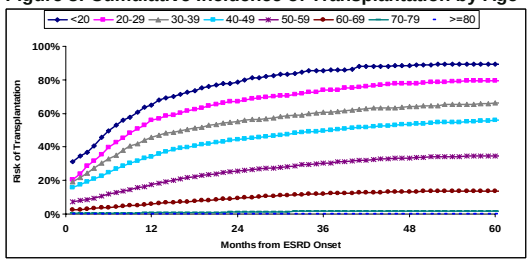
Note: 12 Months: Males n=7407; Females n=5871; 24 Months: Males n=4765; Females n=3930; 36 Months: Males n=3085; Females n=2633; 48 Months: Males n=1923; Females n=1668; 60 Months: Males n=1228; Females n=1147;

Figure 2: Cumulative Incidence of Transplantation by Race/Ethnicity



Note: 12 Months: White n=10054; Black n=2299; American Indian n=324; Hispanic/Latino n=398; Asian/Pacific Islander n=202
24 Months: White n=6355; Black n=1701; American Indian n=223; Hispanic/Latino n=279; Asian/Pacific Islander n=136
36 Months: White n=4058; Black n=1235; American Indian n=145; Hispanic/Latino n=189; Asian/Pacific Islander n=87
48 Months: White n=2452; Black n=853; American Indian n=103; Hispanic/Latino n=109; Asian/Pacific Islander n=57
60 Months: White n=1575; Black n=623; American Indian n=63; Hispanic/Latino n=71 Asian/Pacific Islander n=40

Figure 3: Cumulative Incidence of Transplantation by Age



Note: 12 Months: <20 n=127; 20-29 n=344; 30-39 n=802; 40-49 n=1353; 50-59 n=2212; 60-69 n=3434; 70-79 n=3582; ≥80 n=1421
24 Months: <20 n=83; 20-29 n=202; 30-39 n=524; 40-49 n=894; 50-59 n=1480; 60-69 n=2321; 70-79 n=2395; ≥80 n=815
36 Months: <20 n=35; 20-29 n=140; 30-39 n=359; 40-49 n=603; 50-59 n=1004; 60-69 n=1538; 70-79 n=1575; ≥80 n=442
48 Months: <20 n=23; 20-29 n=92; 30-39 n=257; 40-49 n=406; 50-59 n=659; 60-69 n=1012; 70-79 n=927; ≥80 n=213
60 Months: <20 n=21; 20-29 n=71; 30-39 n=191; 40-49 n=288; 50-59 n=462; 60-69 n=683; 70-79 n=562; ≥80 n=94

Table 1: Adjusted* Hazard Ratios of Transplantation (1982-2005)

Characteristic (%)	Relative Hazard (95% CI)
Race/Ethnicity	
White (80.3)	1.0 (Reference)
Black (13.7)	**0.34** (0.31-0.38)
American Indian (2.1)	**0.53** (0.43-0.65)
Hispanic/Latino (2.6)	**0.49** (0.41-0.58)
Asian/Pacific Islander (1.3)	**0.66** (0.55-0.79)
Age at ESRD Onset	
<20 (1.8)	1.0 (Reference)
20-29 (3.8)	**0.80** (0.71-0.92)
30-39 (7.6)	**0.64** (0.57-0.73)
40-49 (11.1)	**0.46** (0.40-0.51)
50-59 (15.2)	**0.24** (0.21-0.28)
60-69 (22.8)	**0.09** (0.08-0.10)
70-79 (25.8)	**0.01** (0.01-0.02)
≥80 (11.9)	**0.00** (0.00-0.00)
Sex	
Male (56.6)	1.0 (Reference)
Female (43.3)	**0.88** (0.83-0.93)
Median Household Income	
≤ $24,000 (28.5)	1.0 (Reference)
$24,001-$30,000 (29.9)	**1.15** (1.07-1.24)
$30,001-$36,000 (22.9)	**1.13** (1.04-1.23)
> $36,000 (18.7)	**1.13** (1.03-1.24)
Education Level‡	
<45% (68.7)	1.0 (Reference)
45% - 49% (11.1)	**1.06** (0.96-1.16)
≥ 50% (20.3)	**1.18** (1.10-1.27)
Distance to Nearest Dialysis Center (miles)	
<10 (55.8)	1.0 (Reference)
10-19 (22.0)	**1.06** (0.99-1.14)
20-39 (16.1)	**1.26** (1.16-1.36)
≥ 40 (6.1)	**1.21** (1.07-1.37)

*Model is adjusted for all variables in the table plus primary diagnosis

‡ Education level was defined as the percent of the zip code level population with at least some college education

RESULTS

- The unadjusted cumulative incidence of kidney transplantation differed significantly by sex and race/ethnicity (Figures 1 and 2).
- Patients diagnosed with ESRD at a younger age had a significantly greater unadjusted risk of transplantation, compared to patients that were diagnosed at an older age (Figure 3).
- The adjusted hazards ratios for the study variables are shown in Table 1. Significant differences in the risk of transplantation occur by sex, race/ethnicity, and age. A greater zip code level median household income, a higher zip code education level, and a greater distance to the nearest dialysis center were also significant in the adjusted model.

CONCLUSION

Disparities exist in the risk of kidney transplantation by demographic and socioeconomic characteristics among ESRD patients in Wisconsin. However, we were unable to determine whether these disparities reflect differences in patient preferences, differential referral to a nephrologist, or a systematic bias in the ranking system for wait-listed patients.

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